

# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

Vol. XLV  
Number 26

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# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

VOL. XLV.

NEW YORK—THURSDAY, DECEMBER 29, 1921

No. 26

## Crude Petroleum Survey Shows Need for Fuel Conservation

Mexican production, 20% of U. S. consumption in 1920, is falling off. Domestic consumption has not kept pace with demands. Automotive industry has definite duty in research and conservation. Here is a survey of 1921 and an evaluation of the future.

By Joseph E. Pogue\*

THE importance to the automotive industry of an adequate commercial supply of crude petroleum is obvious. Automotive transportation has grown to such tremendous proportions that even those who are closest to this field find difficulty in visualizing its ramifications; and yet this vast structure is absolutely dependent upon the flow from about 270,000 oil wells in this country and about 300 wells in Mexico, every one of which has a natural tendency to decline in output. What are the prospects that new wells may be drilled in sufficient numbers to support the normal growth in automotive fuel requirements? This is a pertinent question, for each year a growing number of successful new wells must be completed merely to compensate for the decline in the production of old wells, and after this is accomplished an additional quota of new wells is prerequisite to any increase in aggregate output. Moreover, the Mexican wells, which in 1921 produced nearly half as much petroleum as was raised to the surface in the United States, are rapidly being destroyed by the invasion of salt water. Should the Mexican supply fail, or even decline sharply, a supply that in 1920 filled 20 per cent of our petroleum needs and 9 per cent of our gasoline requirements, a still

greater burden would fall upon our domestic oil fields and it would be questionable whether the full requirements of our ten million motor vehicles could be met without considerable readjustment.

In 1921 the United States produced approximately 465,000,000 barrels of crude petroleum, imported about 120,000,000 barrels, and consumed about 516,000,000 barrels. These figures, though striking in magnitude, carry little significance if viewed for a single year. It is far more important to know the rates at which these items have been growing and to compare these rates of increase with one another. The problem is dynamic, not static.

A comparison of the production of crude petroleum in the United States with the quantity of crude petroleum imported into this country is afforded by Fig. 1 for the 9-year period, 1913-21. The data are plotted on a ratio scale in order that the slopes of the curves may be proportional to their percentage changes and hence directly comparable. Then the trend of production and the trend of imports are determined by fitting straight lines to the data by the mathematical method of least squares, and these trend lines entered on the chart. The trend lines may be looked upon as the "normal" course of the items, around which the actual figures fluctuate from year to year.

\*Consulting engineer, New York.

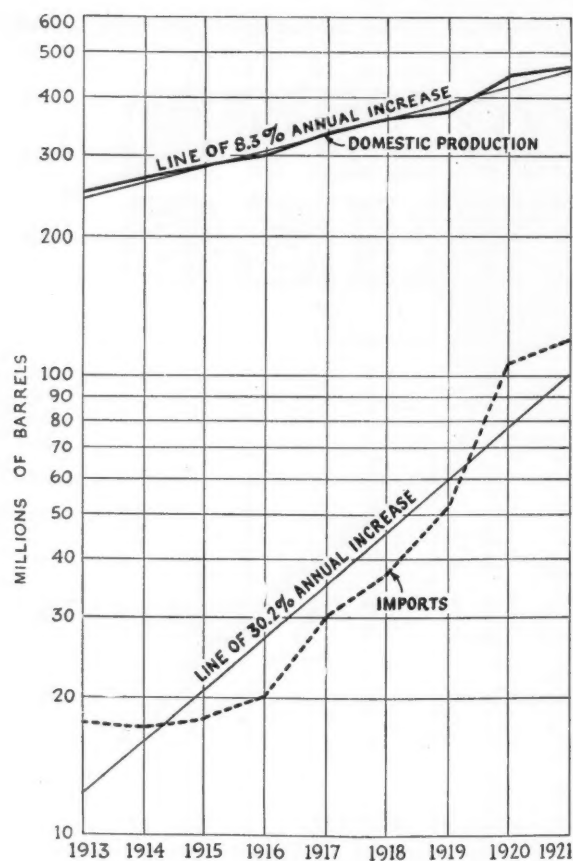


Fig. 1—Trend of domestic production and imports of crude petroleum in the United States by years, 1913-21

The trend is shown in the following table:

Year	(Relative to 1913)						
	Domestic Production, Million Bbls.	Imports, Million Bbls.	Domestic Consumption, Million Bbls.	Imports in Per Cent of Domestic Consumption	Domestic Production	Imports	Domestic Consumption
1913 ..	248	17.8	262	6.8	100	100	100
1914 ..	266	17.2	261	6.6	107	97	100
1915 ..	281	18.1	273	6.6	113	102	104
1916 ..	301	20.6	319	6.5	121	116	122
1917 ..	335	30.2	378	8.0	135	170	144
1918 ..	356	37.7	413	9.2	143	212	158
1919 ..	378	52.8	418	12.6	152	297	160
1920 ..	443	106.0	531	20.0	179	596	203
1921 <sup>1</sup> ..	465	118.0	516	22.8	187	663	197

<sup>1</sup>Estimated.

It is apparent from Fig. 1 that the average increase in the domestic production of crude petroleum during the period shown was 8.3 per cent, while imports increased at the much faster rate of 30.2 per cent. This disparity in growth is strikingly shown by the rapid convergence of the two trend lines on the chart. If we bear in mind that the curves follow the compound interest law, with rates of 8.3 per cent and 30.2 per cent respectively, compounded continuously, we gain some idea of the remarkable degree to which these items have been advancing, particularly imports.

This method of analysis measures accurately the tendency of the items, but cannot give assurance that the trends will continue in the future as they have in the past. The rational deduction would rather be that such phenomenal rates of increase must of necessity slow down. Should imports, for example, continue to 1930 at the rate of 30.2 per cent, this country would then be receiving from abroad the incredibly large total of one billion barrels per annum! Such a volume of

imports, needless to say, is not to be expected, and the calculation is given merely to show how inordinately our dependence upon imported petroleum has been recently growing.

Having observed the trend of the supply of crude petroleum, we may turn next to certain aspects of demand. Fig. 2 shows, on a ratio scale, domestic production of crude petroleum compared with consumption and with price. The data, as in the first instance, have been plotted and then fitted with trend lines by the method of least squares; that is to say, through each curve has been drawn a straight line which expresses the general trend or direction of the curve more closely than any other straight line that might be constructed. It is apparent at once that consumption has been increasing at the rate of 10.4 per cent a year, thus outdistancing domestic production with its rate of 8.3 per cent. We now have an accurate measure of the growth of production and consumption, and it will be clear that the greater growth of consumption as compared with production has been sustained only by virtue of a still greater rate of increase in the growth of imports.

The rapid growth in the consumption of crude petroleum in the United States may be strikingly visualized by reducing the figures to a per capita basis, as shown in the following table and expressed graphically in Fig. 3:

Year	Barrels per person	Year	Barrels per person
1909 .....	1.84	1916 .....	3.19
1910 .....	2.07	1917 .....	3.70
1911 .....	2.25	1918 .....	3.99
1912 .....	2.52	1919 .....	3.98
1913 .....	2.72	1920 .....	4.98
1914 .....	2.67	1921 <sup>1</sup> .....	4.57
1915 .....	2.75		

<sup>1</sup>Estimated.

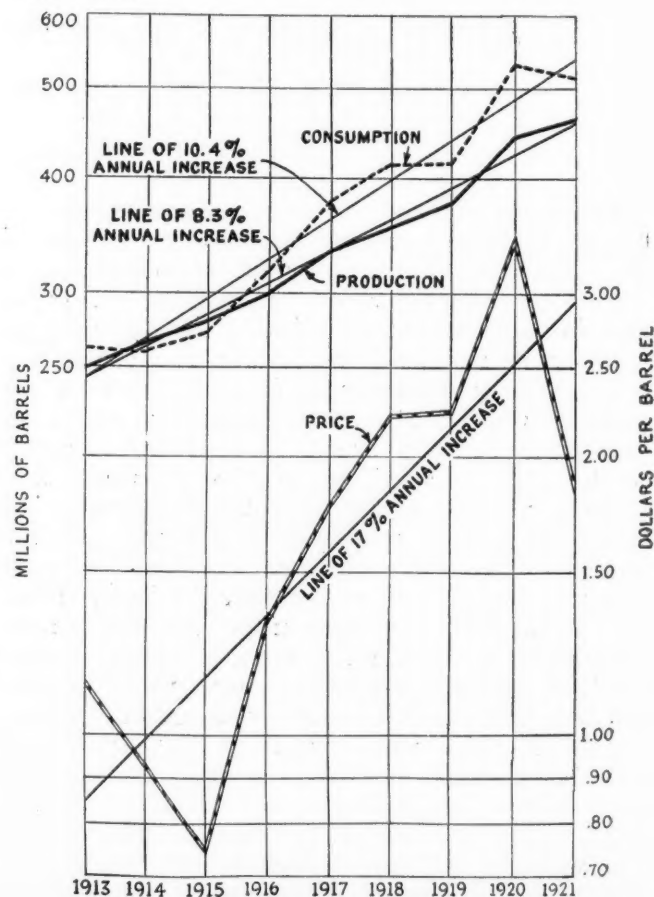


Fig. 2—Trend of domestic production, consumption, and average price of crude petroleum in the United States by years, 1913-21. Note especially the different rates of increase of the three items

Coupled with the enlarging disparity between domestic production and consumption, the price of crude petroleum has been advancing, as also shown in Fig. 2. The price curve represents the weighted average price of crude petroleum in the United States. The trend of this item, as determined by the method of least squares, indicates an average increase of 17 per cent a year. Closer examination of the price curve reveals the extent to which the price of crude petroleum receded in 1921, when it fell about the same degree below "normal" as it did under quite similar circumstances in 1915. The 1921 drop in price was contemporaneous with a decline in consumption and a slowing up in domestic production. In addition to the trend relationships of the three curves of Fig. 2, the detailed variations show a consistency that is interesting and significant, the three tending to accelerate or decelerate in unison.

We have now had, perhaps at the risk of some tedium, an accurate measure of the rates of growth of the principal factors entering into the supply of crude petroleum. Again, it should be emphasized that the differences in the rates of growth of the several factors are fundamentally important and give a valuable clue to the developments that lie ahead.

Reverting to the price of crude petroleum which, as we have seen, has increased 17 per cent a year, on the average, over the past nine years, the question naturally arises as to whether this advance is merely a part of the general increase in prices or represents a fundamental increase as compared to the general price level. This is an important question, because if crude petroleum is really becoming more costly as compared with other commodities, that fact will have an important bearing upon automotive transportation. To arrive at an answer to this question, the actual price of crude petroleum was corrected for the variation in the pur-

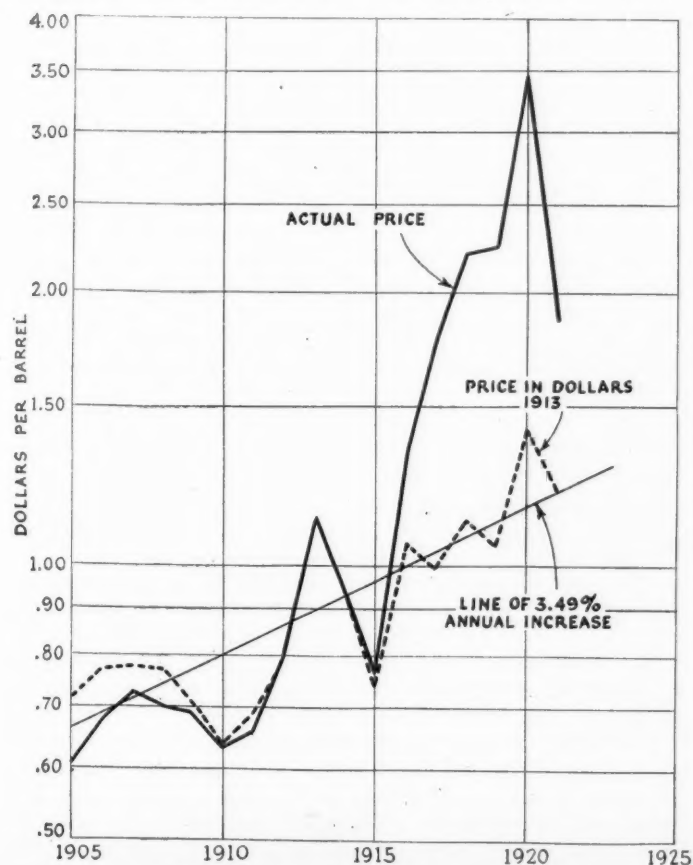


Fig. 4—The actual average price of crude petroleum in the United States compared with the deflated price as expressed in 1913 dollars, by years, 1905-21

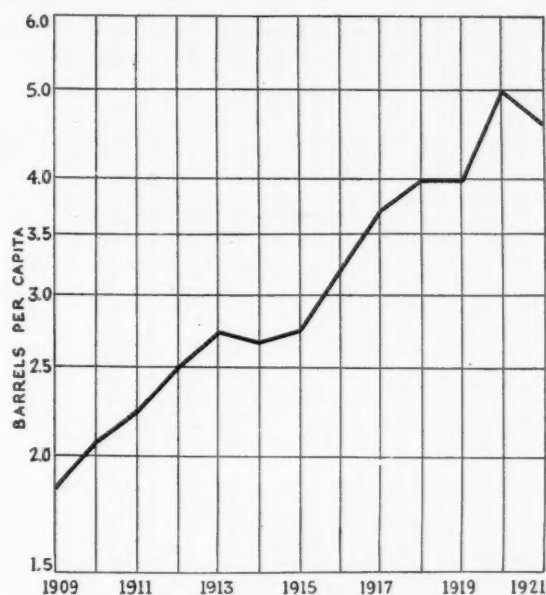


Fig. 3—Per capita consumption of crude petroleum in the United States by years, 1913-21

chasing power of the dollar and a new price in terms of 1913 dollars arrived at.

The course of the actual price, together with a curve of this relative price is given in Fig. 4, where it will be seen that the price as expressed in 1913 dollars has an unmistakable upward trend over the sixteen-year period shown. By fitting a straight line to the price as expressed in 1913 dollars, using the method of least squares, the trend of this item is determined to be upward at the rate of 3.5 per cent a year, compounded continuously. We thus arrive at a measure of the funda-

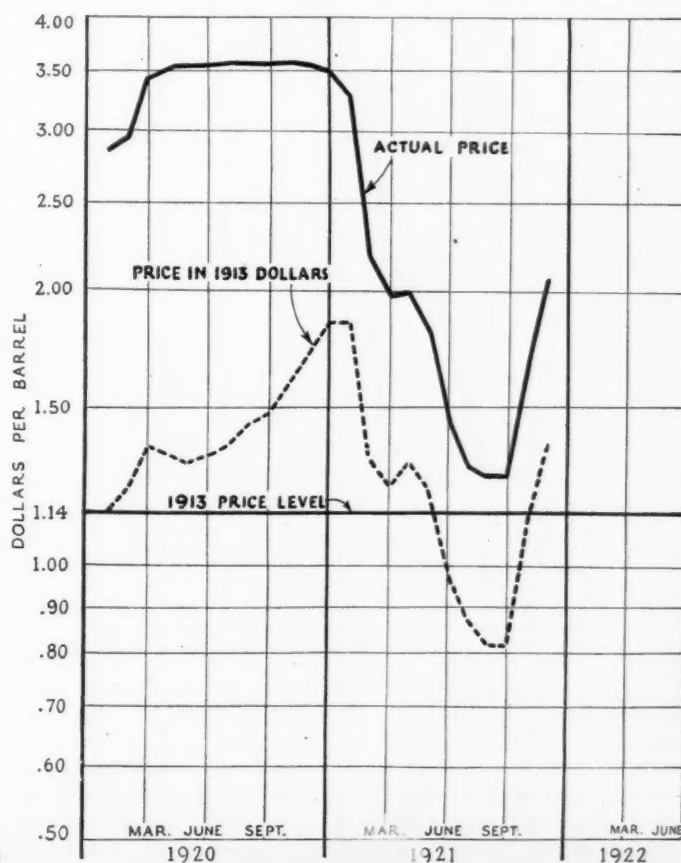


Fig. 5—The actual average price of crude petroleum in the United States compared with the deflated price as expressed in 1913 dollars, by months, 1920-21



mental upward trend of the price of crude petroleum, upon which is superimposed an additional advance by virtue of the upward move in the general price level.

#### Average Prices

Year	Average Price of Crude Petroleum. In actual Dollars	Average Price of Crude Petroleum. In 1913 Dollars	Year	Average Price of Crude Petroleum. In actual Dollars	Average Price of Crude Petroleum. In 1913 Dollars
1905 ..	.61	.72	1913 ..	1.14	1.14
1906 ..	.68	.77	1914 ..	.93	.93
1907 ..	.73	.78	1915 ..	.75	.74
1908 ..	.70	.77	1916 ..	1.33	1.07
1909 ..	.69	.71	1917 ..	1.77	1.00
1910 ..	.63	.64	1918 ..	2.22	1.13
1911 ..	.66	.69	1919 ..	2.25	1.06
1912 ..	.80	.79	1920 ..	3.44	1.42
			1921' ..	1.86	1.20

'Estimated.

This fundamental upward trend is to be attributed to the increasing cost of maintaining our domestic production through deeper wells and enlarging field activities. This residual price trend, it may be added, offers a scientific means for forecasting the minimum price advance that may be expected in the future, although a shortage in supply would accelerate the rise from such a minimum.

The deflated price of crude petroleum will repay further study. Accordingly the actual and deflated prices are plotted by months over the past two years, as shown in Fig. 5. The curve representing actual price depicts the price history of crude petroleum during 1920 and 1921, showing clearly the high level reached in 1920, the precipitous decline suffered during the first half of 1921, and the sharp upward reaction that characterized the fourth quarter of the year. The curve representing

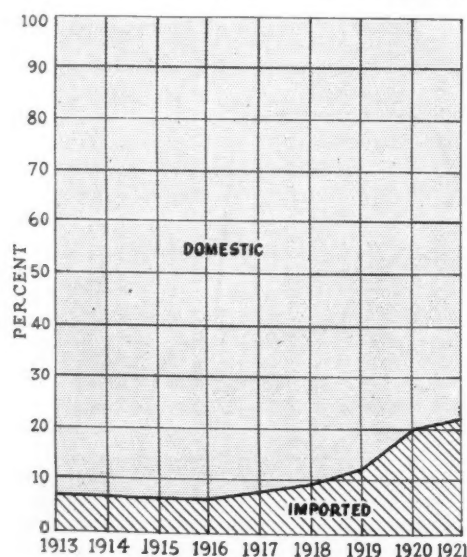


Fig. 6—Percentage analysis of the consumption of crude petroleum in the United States by years, 1913-21, showing the ratio of the imported to domestic supply

deflated price brings out certain additional features, especially the growing resistance experienced in 1920 in holding up against the decline in the general price level and the amazingly low level reached in August and September of 1921.

The analysis to this point may be summarized: A rapidly mounting consumption of crude petroleum in the United States has been supported by (a) a marked, but less rapid, increase in domestic production, (b) a rising price level for domestic petroleum in the course of exploiting deeper and more extensive pools and (c) a

remarkable rate of increase in imports from Mexico. Such is the balance between the major factors in supply. Had it not been for the prolific oil-pools of Mexico, either our supply of crude petroleum would have already fallen short of requirements, or else domestic fields would have been forced to higher productivity under the impetus of a higher price level. These alternatives, neither wholly satisfactory to the automotive industry, lead us to the crux of the situation—the impending decline in imports owing to the rapid exhaustion of the proven oil-pools of Mexico. An appraisal of this factor requires a careful examination of the evidence as regards the condition of the Mexican fields.

In 1920 Mexico produced 24 per cent of the world's output of crude petroleum, or 37 per cent of the production of the United States, with slightly greater proportions in 1921. Most of the Mexican output is consumed in the United States, and the relative importance of this increment is indicated by Fig. 6, which shows our consumption of crude petroleum over the past nine years divided into the part contributed by domestic fields and the part supported by imports from Mexico.

Practically all the oil thus far produced in Mexico has come from a restricted zone on the Gulf Coastal Plain, a few miles inland from Tampico and Tuxpam. The productive area (see Fig. 7) is divided into the Northern Field, yielding heavy crude almost devoid of gasoline, and the Southern Field, producing light refinable crude with about a 12-15 per cent gasoline content. The Northern Field has been producing about one-quarter of the total output of the country; the Southern Field, about three-quarters. Each field comprises a number of individual oil-pools, as shown in Fig. 7.

The oil occurs under remarkable geological conditions, without parallel elsewhere in the world. It occupies porous and cavernous portions of a limestone formation in proximity to intrusive masses of igneous rock and rests upon a salt water table under artesian head. In consequence, when a pool is tapped, the productivity of the well is phenomenal, but its life under unrestricted flow is apt to be relatively short and finally the water level rises and the well ceases to produce oil, but instead becomes an artesian well. These conditions have enabled the producer to deplete through a few wells and within a brief period of years a reserve of oil that under ordinary conditions would have required thousands of wells and several decades to exhaust. The Mexican pools to date have produced about 700 million barrels of crude petroleum, and there are probably about 200 to 300 million barrels of proven oil still remaining to be produced, not counting future developments and discoveries.

But, here again, the fundamental question is not a matter of magnitudes, but of rates. This distinction cannot be stressed too strongly. The question is not how much oil we are going to recover eventually, but how rapidly we are going to get it. This has been the controlling factor so far and bids fair to continue so.

The salt water, which underlies the oil in the Tampico-Tuxpam area, is rapidly encroaching upon the productive oil-pools. During 1921 many of the pools became extinct, some with sensational suddenness. So far the aggregate output of the country has not fallen to a degree suggested by these events, since a decline in some of the pools has been partly compensated by an increase in productivity of some of the less exhausted deposits. So large are the individual wells that a given pool may be made to produce with almost unbroken intensity up to the very end—a condition in marked contrast to the performance of pools in the United States which display a prolonged period of declining output before exhaustion.

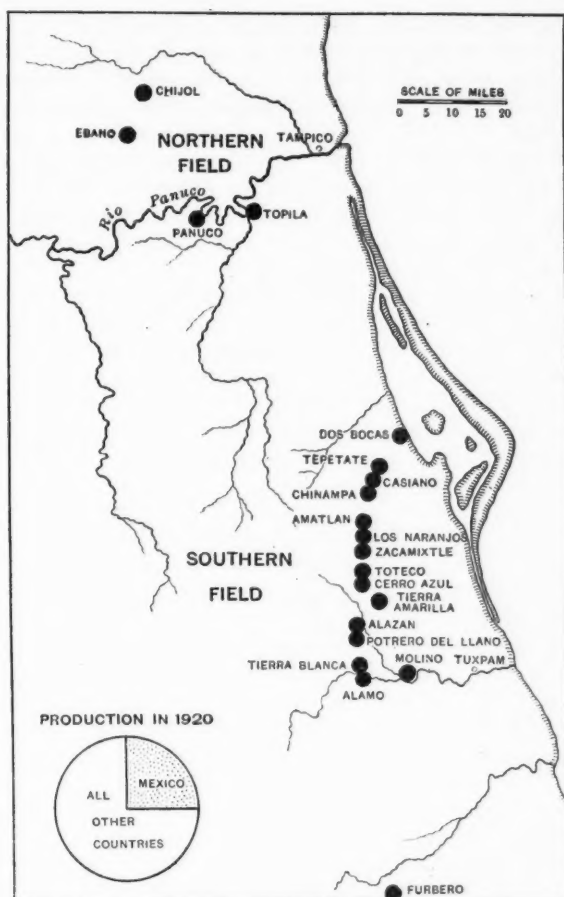


Fig. 7—Sketch map showing the location of the important proved oil-pools of Mexico. Many of the pools shown are extinct. (After Pogue, *The Economics of Petroleum*)

The seriousness of the situation in the Mexican oil-fields may be perhaps most convincingly conveyed by a series of quotations from informed individuals who have publicly expressed themselves on the subject.

In March, 1921, Ralph Arnold, a well known petroleum engineer, stated in *Mining and Metallurgy*, a publication of the American Institute of Mining and Metallurgical Engineers:

"Mexico is now producing at the rate of about 600,000 bbl. per day; approximately two-thirds of this is coming from Los Naranjos, a pool which will probably be extinct by early summer on account of the encroachment of salt water. If the present rate is maintained throughout the year, 1921 will see about 220,000,000 bbl. of oil brought to the surface in Mexico, or about one-half the probable production of the United States for the year. But Mexico's proven reserve is less than twice this amount, hence, at the present rate of production, the latter part of 1922 will see the end of the proven big fields in Mexico. There is little wildcatting going on in Mexico now, probably not over 25 strictly wildcat wells now being actively drilled outside the main producing district. Whether it is 1½ years or 2 years, or even a little longer or a little less before the break comes, it is certain to come."

In September, 1921, L. G. Huntley and Stirling Huntley, two petroleum geologists, published an article in *Mining and Metallurgy*, in which they described the salt water flooding of the Mexican pools, but expressed the opinion that a reduced yield could be maintained for several years until new fields in Mexico could be developed.

"...after all the southern pools have been flooded," they stated, "there will still be a production in the Mexican fields of 250,000 barrels per day at the end of 1000 days from July 1, 1921 (Dec. 1, 1924) on the assumption that the new drilling in the Panuco River field increases

production....It seems probable that the present fields will continue to produce oil in large quantities during the time necessary to carry on prospecting for additional pools....However, the opening up of these new fields will require new roads, railways, and pipe-lines....Costs of producing and operating will be higher than in the past, wells, in general, will be smaller, fields will be more disconnected."

In October Roy H. Flamm, expert, Latin-American Division of the U. S. Bureau of Foreign and Domestic Commerce, published in *Commerce Reports* a detailed compilation on the petroleum industry in Mexico, in which he said:

"The older fields of Mexico will continue to give oil for a considerable time to come, but such production probably will be increasingly smaller from the peak of 1920-21. Many of the wells now being developed in the Amatlan pool show tendencies to develop salt water more rapidly than heretofore."

Later on in the article Mr. Flamm apparently contradicts his earlier conclusion in stating:

"The present fields in Mexico will continue their large production for a sufficient time necessary to develop known areas and to wildcat less known territory." He adds: "It is expected that the cost of production and operation in the future will be higher than in the past, due to the fact that the wells will be smaller, the fields more disconnected, taxation higher, and Government regulations more stringent."

In an address before the annual meeting of the American Petroleum Institute in Chicago on Dec. 8, Harry F. Sinclair, chairman of the Board of Directors of the Sinclair Consolidated Oil Corporation, said:

"We are told that the Mexican fields are doomed. It must be admitted that the situation there is serious, but although I personally believe that the Mexican produc-

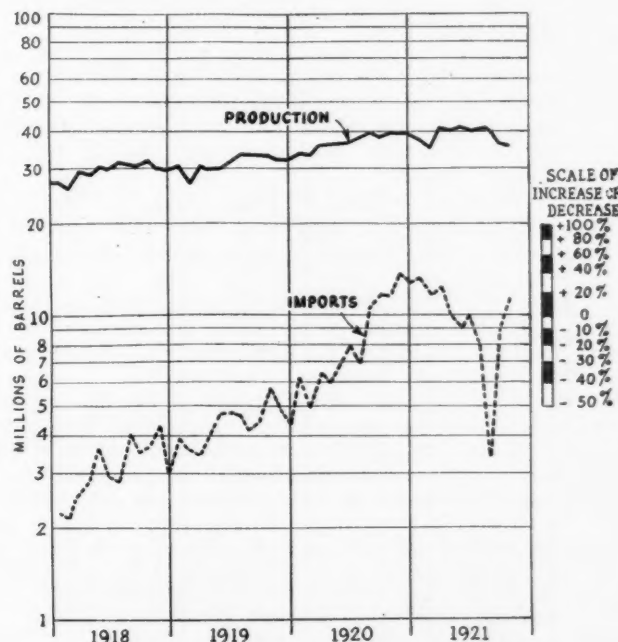


Fig. 8—Current trend of domestic production and imports of crude petroleum in the United States by months, 1918-21

tion will be as great ten years from now as it is to-day, we cannot safely, as American citizens, disregard the possibility that the Mexican production may fall to an insignificant total, at least temporarily, and that Mexico may disappear as a real petroleum factor until new Mexican fields are discovered."

"Mexico, last year, produced 23 1-3 per cent of the world's total production of petroleum. If Mexico drops out, what will be the effect on the petroleum situation? What will be the effect upon the United States? Can



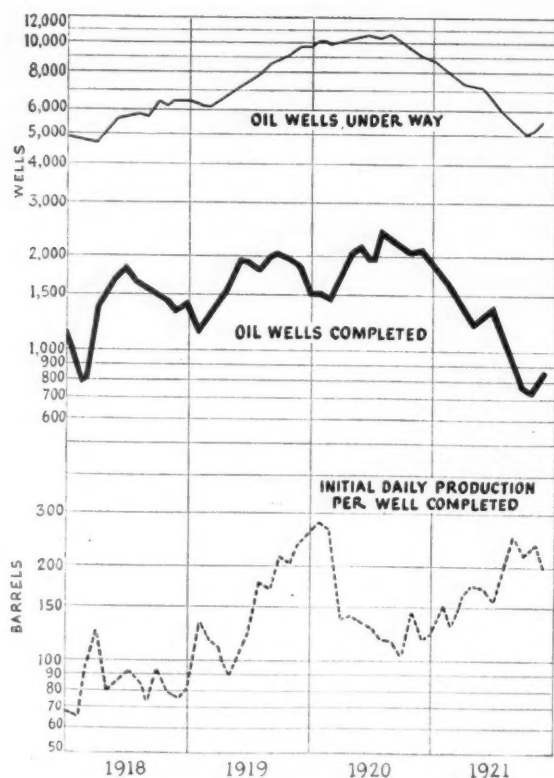


Fig. 9—Trend of oil-field activity in the United States (exclusive of California) by months, 1918-21

you cut off a quarter or a fifth of the world's production without placing a strain upon the petroleum market of the United States?"

"A large part of the Mexican production comes to this country. Suppose that source of supply were shut off. Some will point to our large stocks of crude oil in storage. But do you realize that the total quantity of crude oil above ground in this country is only about four months' supply?"

The December number of *The Lamp*, an official organ of the Standard Oil Company of New Jersey, discusses the Mexican oil situation in some detail, stating among other things:

"It is the belief of some producers that districts now yielding about 500,000 barrels of oil a day will be practically exhausted in the latter part of 1922. These are the fields from Tepetate to and including Cerro Azul... all of the oil taken from Mexico to-day has come from big wells, where the cost per barrel has been down to minimum. If Mexico is to continue to figure it will be necessary to assume the heavier cost per barrel of getting oil from small wells. This is not justified by the prevailing margin of profit after paying taxes... Since the prospects of the practical exhaustion of the southern fields has become real, the complications of Article 27 of the Mexican Constitution, together with political unrest and inadequate protection for workers, have effectively limited wildcatting."

In the *Economics of Petroleum*, published in December, the present writer expressed an opinion on the Mexican outlook in these words:

"The output of Mexican petroleum is probably due for a slowing down in the period immediately ahead. If the rate of production of early 1921 is sustained, 1922 may see the end of the proven big fields of Mexico. On the other hand, special conditions may lead to a reduced rate of output earlier and a consequent spread of the remaining supply over a period of years. In either event, new productive pools, either in the Tampico-Tuxpam area or elsewhere in Mexico, can scarcely be developed with sufficient celerity to maintain an unbroken increase in that country's production of petroleum."

The conclusions quoted above, coming both from technical and commercial sources, are perhaps sufficient to indicate that the production of crude petroleum in Mexico at best cannot be expected to increase during the next few years and at worst may fall to a startlingly low level during 1922. It also appears certain that the cost of producing petroleum in Mexico is bound to advance and the flood of cheap Mexican oil which has come upon the American market during recent years will soon be a thing of the past.

What effects will these developments have upon the domestic petroleum situation? Fig. 8, comparing the growth of production and imports of crude petroleum by months during the past few years, should be examined with this question in mind. The significance of a downward trend in imports will then become clearer. One-quarter of our supply of crude petroleum would in that event gradually withdraw its support at a time when our requirements are increasing. Mexico, therefore, holds the possibility, in fact the probability, of throwing a greatly increased burden upon our domestic oil-fields. Let us now examine domestic production with a view to determining its capacity for expansion.

We have previously seen that domestic production during the past nine years has been increasing at the annual rate of 8.3 per cent, compounded continuously, and this rate of increase has been supported by a fundamental increase in price of 3.5 per cent annually over and above an increase due to the rise in the country's general price level. Production statistics are informing in respect to tendencies, but give no assurance of what may be expected in the future; there are data, however, that have usefulness in this direction and these are records of drilling activity as compiled from month to month by certain of the oil journals, notably *The Oil and Gas Journal*.

Fig. 9 brings together in graphic form the more significant of the well data for the oil-fields east of California. The data are plotted by months over the past four years. The most striking feature of the chart is the upward trend of the curve representing the number of oil-wells completed and the notable downward departure from this trend during 1921. If we fit a straight line to the curve representing the number of oil wells completed for the three years, 1918-20, by means of the method of least squares (excluding 1921 because of its obviously abnormal character), we find that the "normal" increase in successful well completions necessary to support our increase in production of 8.3 per cent is 18.2 per cent. In other words, oil-field activity, before the slump of 1921, was speeded up to the phenomenal rate of 18.2 per cent per year and this was only capable of maintaining an increase in production of 8.3 per cent.

Reasoning further along the same line, and for the moment eliminating from consideration variations in the size of new wells, we find that in order to sustain production at its past rate of 8.3 per cent, we should have drilled 28,000 successful wells in 1921 (instead of approximately 14,000), and in 1922 should drill 33,000 wells. As a result of a decline in drilling during 1921 of 50 per cent from "normal," the rate of increase in domestic production has slowed down during the second half of 1921 to approximately 0, that is, production is barely being maintained at an even level. To advance drilling to a total of 33,000 successful wells in 1922, even granted that such expansion could be financed, would not compensate for the momentum lost during the restricted drilling of 1921. The conclusion to be drawn from this rather tedious line of reasoning is that our past rate of domestic production has already slowed down and cannot be forced up to its former rate of perform-



ance without the intervention of a tremendous campaign of drilling over the next few years such as could be expected, if at all, only under the impetus of further and perhaps drastic rises in price.

The analysis as drawn in the preceding paragraphs is in broadest outline merely. There are many fluctuations which temporarily tend to upset any deductions drawn from past performance. For example, the exploitation of the Mexia Pool in central Texas during the fourth quarter of 1921 has contributed oil to the extent of about 8 per cent of the country's entire production. This sudden increment to supply has, for the time being, partly offset the effect of curtailed drilling at large. Such sensational developments are always possible in oil, but their effect is progressively less from year to year; five years ago a pool the size of Mexia might have already broken the market by creating a great surplus of oil. The Mexia Pool has recently displayed some disquieting signs of being short lived.

Reference again to Fig. 9 will disclose that during the past twelve months the number of oil-wells under way in the oil-fields of this country exclusive of California has declined about 50 per cent, the curve representing this item synchronizing closely with the curve of oil wells completed. The marked rise of the former curve during 1919-20 is very suggestive of the intensive and even feverish campaign of oil-field development that was waged in those years. Coincident with the decline

in drilling since the middle of 1920, there has been an increase in the productive size of the new wells completed. This feature is clearly shown by the curve in Fig. 9 marked "initial daily production per well completed." The explanation is that during the industrial depression such wells as were drilled were almost exclusively confined to the best-proven territories where the chances of tapping rich deposits were a maximum. In other words, the decline in drilling that characterized late 1920 and 1921 was largely a decline in explorational drilling, as contrasted with developmental drilling. This fact will tend to retard an increase in production, since exploration must, of course, precede development. For the past eighteen months we have been using up our blocked out ore, so as to speak.

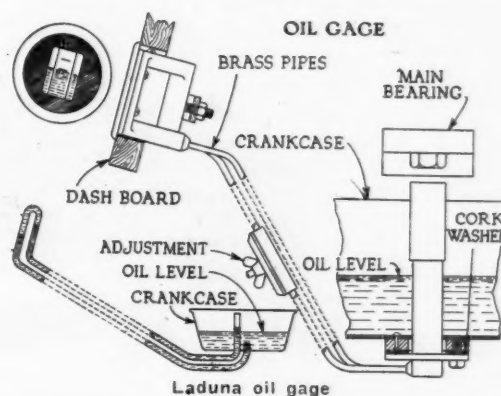
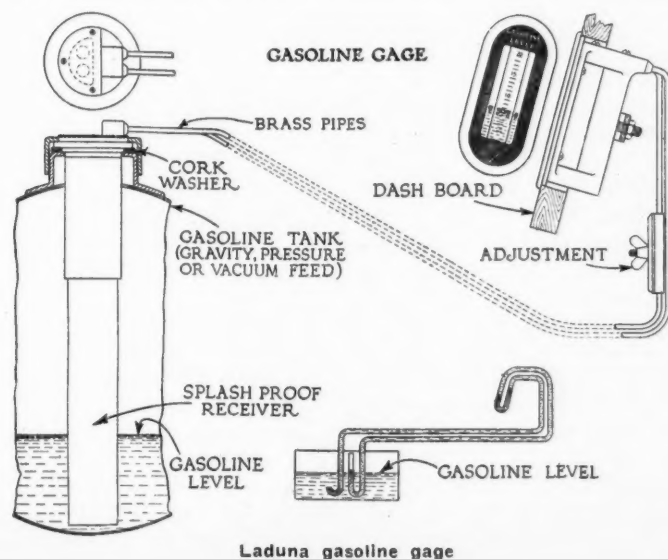
Bringing together, in conclusion, the various strands of our argument, we find (a) domestic production of crude petroleum slowing down, and (b) imports threatening to decline with sharp curtailment probable upon further exhaustion of the proven oil-pools of Mexico. Should the demands for oil fail to fall off proportionately, we may expect to see an increased burden placed upon our domestic oil fields, such as will accelerate the rising price level of crude petroleum. Should domestic production not be able to respond quickly enough under this impetus the alternative will be a readjustment in consumption pending the development, if possible, of adequate foreign sources of supply.

## Level Gages Operating on the Hydrostatic Principle

**A** LINE of gasoline and oil gages without moving parts has been brought out by the Laduna Products Co. The action of these gages is based entirely on the hydrostatic balance of inelastic liquids.

For the gasoline gage a tubular receiver is inserted into the gasoline tank, and from this receiver two small brass pipes are led to the gage proper on the dashboard. The indicating red level in the glass tube of the gage registers the contents of the tank in gallons. The gage is said to be very sensitive and accurate at all points of its scale, there being no lost motion in the parts of the apparatus.

The receiver may be removed from the tank and replaced without affecting the accuracy of the apparatus, provided the pipes are not disconnected. The gasoline



also may be completely drained from the tank, as, for instance, for railroad transportation over a short distance. For a long-distance shipment and for winter storage it is necessary, in order to prevent the evaporation of the liquids in the tubes, to lock the receiver by giving a half turn to the locking tube.

The readings of the gage are said to be unaffected by the various driving conditions, especially if the receiver is placed in the center of the tank. The indicating level remains stationary and quiet under fast driving on rough roads, hills and curves when accelerating or braking.

The temperature effect on the pipes is nearly balanced and made practically negligible. The scale may be easily adjusted for correct readings for winter or summer conditions by simply giving an adjusting screw a turn.

The oil gage has a receiver fitted into the crankcase from the bottom. This receiver may be also removed and replaced without disturbing the accuracy of the gage.

These gages were invented and developed by the Russian scientist, L. A. Dunajeff.

# Original Engineering Features in New Six-Cylinder Car

Extra flywheel at front of engine is said to minimize vibration and permit wide speed range on high gear. Cylinders and half of crankcase are in one piece, but bell housing and chain case are bolted on units. This is done to facilitate production. Cone clutch running in oil is employed.

By J. Edward Schipper

THE new Rickenbacker six, which is now in production and will be introduced to the public at the New York show, has been designed and will be manufactured almost entirely by the Rickenbacker Motor Co. in the Detroit plant originally erected by the Springfield Metal Body Co., and later known as the Dissteel Wheel Plant of the Detroit Pressed Steel Co. The production schedule calls for 12,000 cars the first year, and the factory is tooled up in a way to make this number or a greater quantity easily attainable.

The new car is of considerable interest because it incorporates departures from usual engineering practice, as well as original ideas from a production standpoint. When it is considered that the car will sell for under \$1,500, according to factory officials, although the price will not be announced until the New York show, the speed range and general construction are particularly noteworthy. The touring car, ready for the road, incorporating a six-cylinder, block cast engine, weighs 2650 lb. The wheel base is 117 in. The car has a speed range of from 2 to more than 60 miles per hr. on high gear. In driving over roads around Detroit the writer was unable to detect any engine period between 3 and 63 m.p.h., and on allowing the engine to race while idle, practically no vibration of the fender or other sheet metal parts was discernible up to very high speeds.

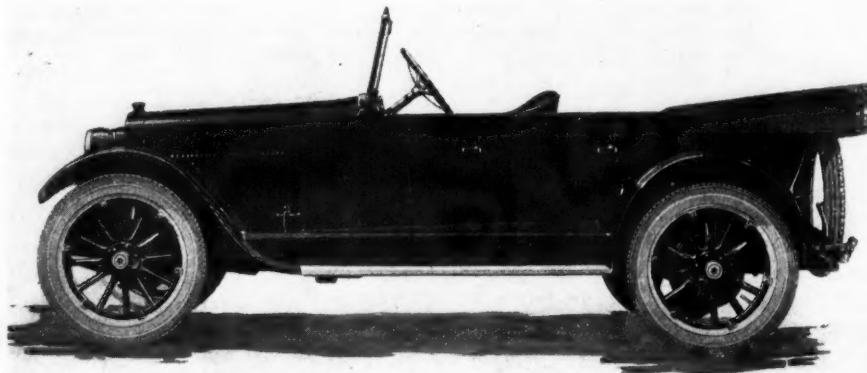
Outstanding features of the car are its heavy box construction frame, flywheels at front and rear of the engine, and extra long rear springs. A number of new processes are used in manufacturing. The cylinder block and the upper part of the crankcase, which latter is of deep section for rigidity, are cast together. The cylinder bore is  $3\frac{1}{8}$  in. and the stroke is  $4\frac{3}{4}$  in., giving a stroke-bore ratio of 1.52. The block casting is so designed that the chain case and the flywheel housing are bolted on, thus simplifying the casting and the machining processes. The cylinder bores are given a ground finish and because of the elimination of the usual unit bell housing, the casting makes an exceptionally good

manufacturing proposition, easy to handle in the shop.

With a clearance volume of 21 per cent of the total volume the engine develops 58 b. hp. at 2800 r.p.m. With a displacement of 218 cu. in., this is at the rate of 3.76 cu. in. per hp. The final drive ratio is 4.63 to 1, with 32-in. tires. The cylinder heads are cast separately and incorporate the combustion chambers, which are machined completely and polished to prevent carbon accumulation.

The pistons are of cast iron and are  $4\frac{1}{4}$  in. in length, in accordance with the trend toward long pistons. Three piston rings are used, these being of the hammered type,

$\frac{3}{16}$  by  $\frac{1}{8}$  in. The piston pin bears in the piston bosses and is  $\frac{3}{4}$  in. in diameter by  $2\frac{3}{4}$  in. in length. The nominal piston clearance at the top is 0.011 in. and at the bottom, 0.00325. The pistons are finished by grinding and the bottom of the piston is provided with a sharp cutting edge to act as an oil scraper. The



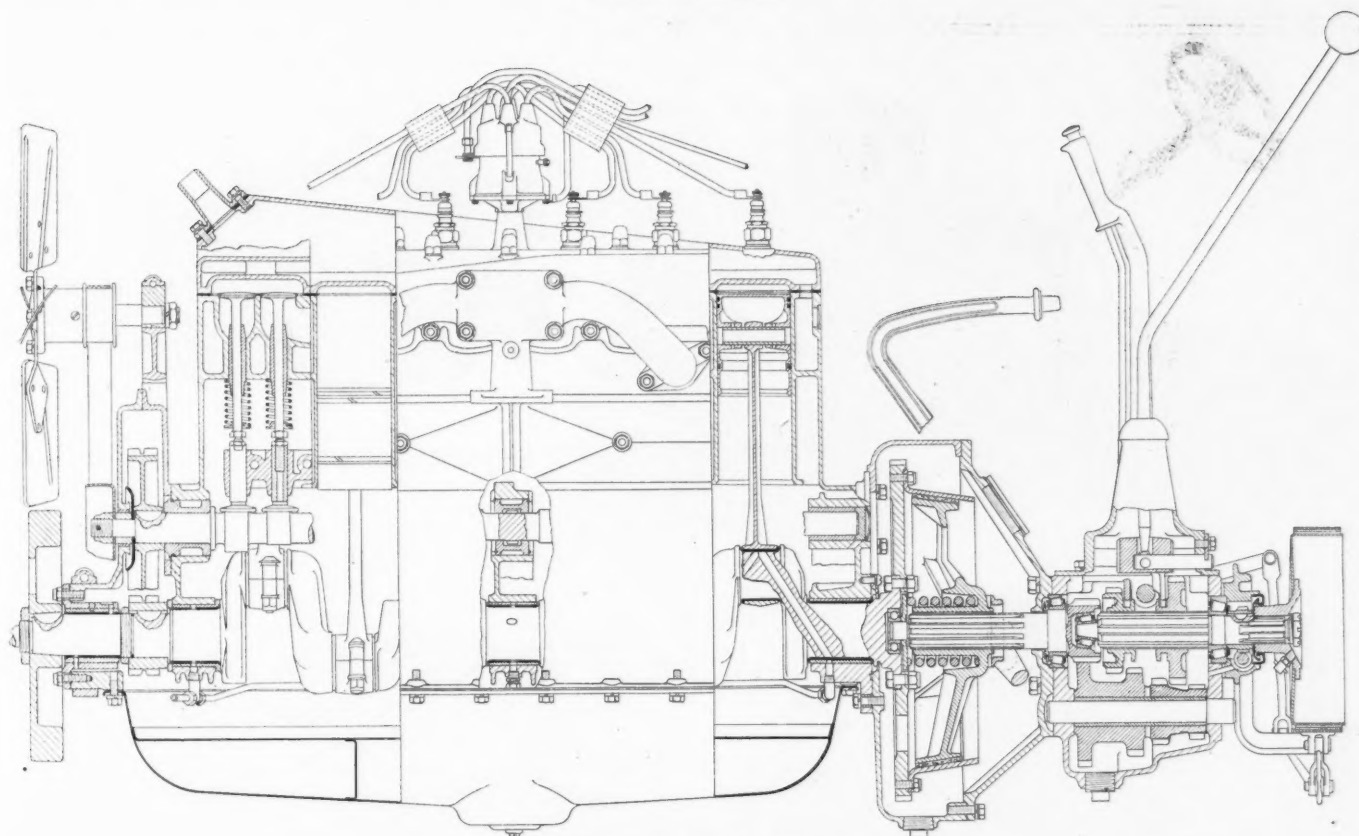
Five-passenger Rickenbacker touring car

bottom surface on each of the three piston rings is also finished in the same manner so as to remove the oil from the cylinder walls on the downward stroke. It is claimed that in tests with this type of piston as many as 150 miles have been attained to a pint of oil.

The connecting rods are drop forgings with a heavy babbitt liner at the large end. The feature of the connecting rods is the method of finishing. It is usual practice to check the alignment of the rod on a gage, and if it is not true, to bend the rod to check properly on the gage. On the Rickenbacker car, on the contrary, the small end of the connecting rod is ground to assure alignment. This process was developed by several manufacturers in grinding connecting rods for airplane engines during the war. The alignment is for the purpose of eliminating side friction of the piston, which insures an easier and smoother running engine, and will have a tendency to eliminate scoring. The lower connecting rod bearing is  $1\frac{3}{4}$  in. in length by 2 in. in diameter.

The crankshaft is a three-bearing type, the nominal diameter of the shaft being  $2\frac{1}{4}$  in. The shaft is dynamical-





Longitudinal elevation, sectioned, of Rickenbacker power plant

ly balanced and is of the curved cheek type. It is a Wyman-Gordon forging. An unusual feature of the crankshaft and flywheel assembly is that there are flywheels at both ends, of about equal weight. This breaking up of the flywheel into two parts is claimed to have a great deal to do with the smoothness of the engine. The total flywheel weight is about 50 lb. The crankshaft bearing dimensions from front to rear, diameter and length, are:  $2\frac{1}{8}$  by 2-3/16 in.,  $2\frac{1}{4}$  by  $2\frac{1}{2}$  in.,  $2\frac{1}{4}$  by 2-5/16 in.

A Morse chain is employed for the front end drive. The chain runs over three sprockets, one on the crankshaft, one on the camshaft and the other on the generator and water pump shaft. The latter shaft is provided with a screw adjustment to take up slack in the chain.

The drive for the oil pump and distributor is taken from the camshaft by helical gears. The ignition distributor is placed in a very accessible position on the top of the cylinder head at about the center of length, which keeps the ignition device away from oil and water and also shortens the length of the high tension leads. The oil pump is driven from the bottom of the same shaft, which gives a balanced drive for these two units.

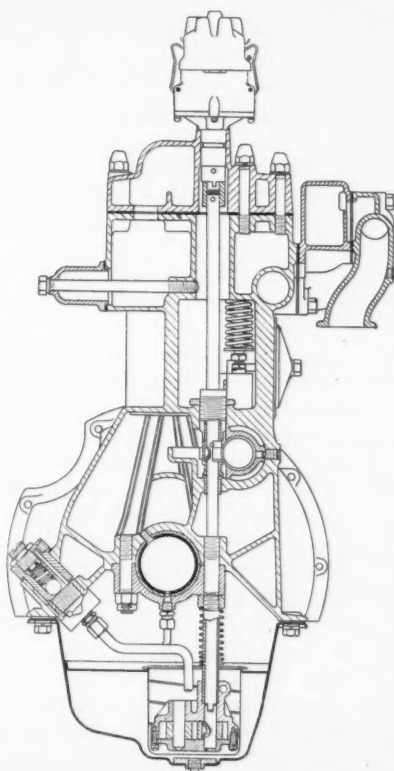
The valve drive is conventional in layout, the valves being on the left side of the engine and driven by push rods of the mushroom type. The guides are in groups of six and are readily removable without taking off the cylinder block. The valve material is the same

for both the intake and exhaust valves, the head being of cast iron and the stem of cold-rolled steel. The valve diameters are  $1\frac{1}{2}$  in. in the clear, with a lift of 5/16 in.

Lubrication is by a pressure system, the oil passing from the pump at the center of the engine and at the lowest portion of the sump through a lead contained in the crankcase to the crankshaft, which is drilled to supply oil to all the main bearings and the connecting rods. There is a lead also to the extra bearing, which is provided at the extreme front end of the shaft to support the balancing flywheel. The oil pump assembly is accessible from the lower end of the engine and can be removed for inspection without dropping the bottom pan. The oil filler opening is large and high so that it is readily accessible and the pressure regulator for the oiling system is also accessible upon lifting the hood.

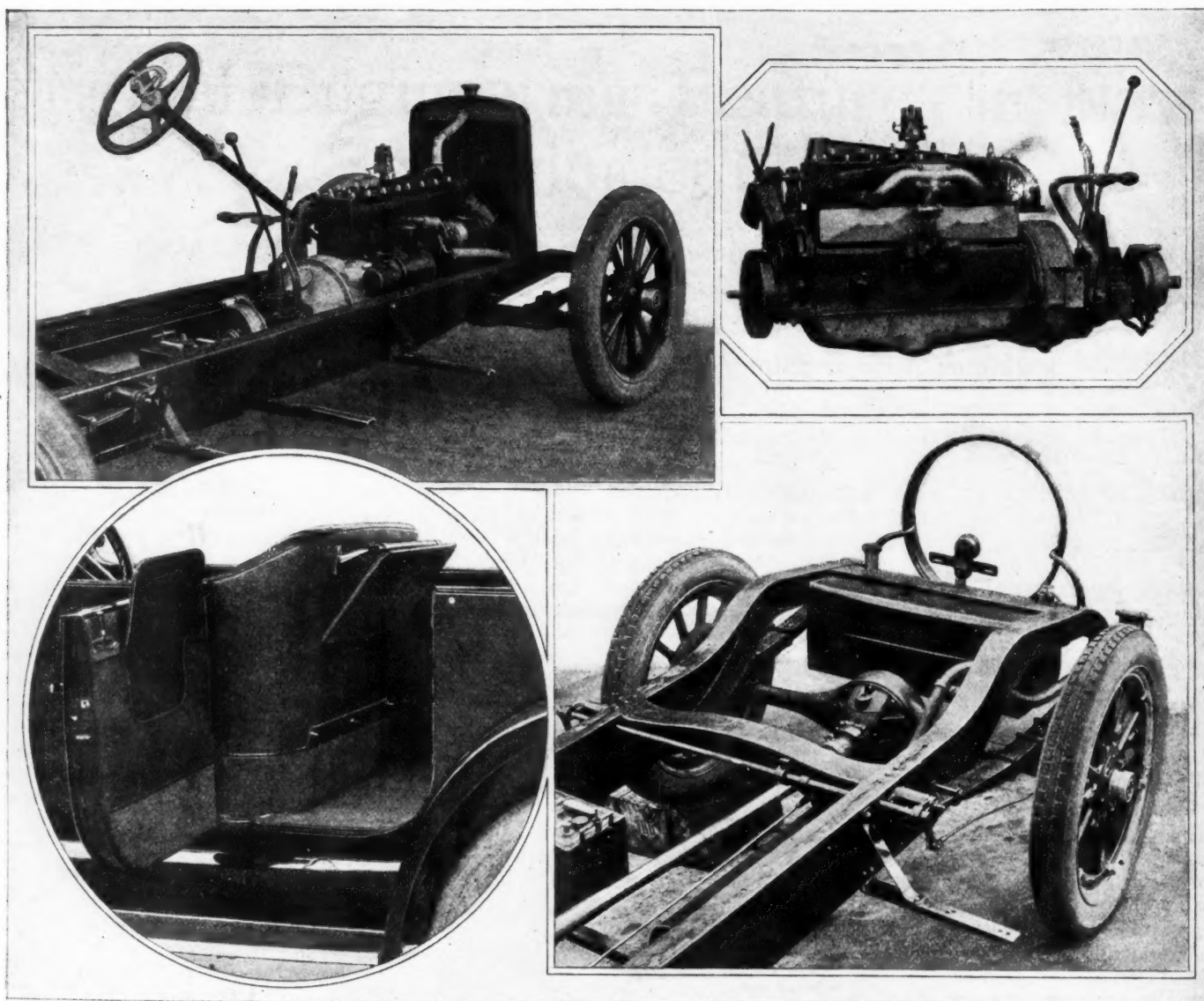
Cooling is by pump circulation, the centrifugal pump being located immediately behind the generator on the right side of the engine and driven through the generator shaft. Water enters the block at about the center of its length and is distributed both ways from this point. The water flows upward to the cylinder head casting, where it enters the water header and discharge pipe. The radiator is a cellular type and the water system has a capacity of 4 gal. The fan is a four-blade unit driven by a leather fan belt 1 in. in diameter from a pulley on the end of the camshaft.

The gasoline system is fed from a



Cross section of engine





Front end of Rickenbacker chassis, showing running board support and mounting of unit powerplant. Left side of Rickenbacker powerplant, showing ramshorn hot-spot manifold, two flywheels, fan drive and other details. Door pockets and pocket in rear of front seat for side curtains. Rear-end of frame, showing mounting of rear springs for Hotchkiss drive

21-gal. tank mounted in the rear of the chassis under a sheet steel cross-member, which is pierced for the filler and gage. Gasoline is fed from a Stewart vacuum tank to a 1¼-in. Stromberg carbureter. The intake manifold is of the ramshorn type with a hot-spot center, carrying the gases to the intake passages which are cored in the cylinder head and so arranged as to be in contact with the water spaces to prevent recondensation of the gases.

An inverted cone clutch of Rickenbacker design is used. This clutch has a Raybestos facing running in a bath of oil. It is claimed that the combination of the Raybestos facing and the oil bath eliminate any possibility of burning and, at the same time, insure a smooth action. The clutch on demonstration held perfectly when the car was started in high gear. The remaining power transmission units are conventional in design, the gearset being a three-speed unit with an aluminum transmission case. This same material is used for the rear flywheel housing. A transmission brake is employed for emergencies, this being a contracting band type mounted just behind the gearset. The propeller shaft is tubular with two Bowling Green universal joints. The final drive is through a floating axle with spiral bevel gears. The spiral gear ratio is 4.63 to 1.

The axle is housed in pressed steel and has 1½-in. alloy steel shaft. The foot brakes are on the rear wheels and act on 14-in. drums. They are external contracting type with 2-in. Thermoid bands. The front axle is drop forged I-beam, with ball-bearing steering knuckle.

One of the interesting features of the car is the deep and wide section of the frame channels. There are seven cross-members and this, in combination with the wide flanges, gives exceptional rigidity. Picking up one corner of the frame from the ground, it can only be lifted 2½ in. before the other extremity of the same side member leaves the ground. Usually the spring in the frame, on lifting up one corner in this way, is 4 or 5 in., at least, and sometimes 7 and 8 in. Both the front and rear springs are long, the front being 36 by 2 in., and the rear 57 by 2½ in. The wheels are wood artillery with embossed spokes. The tire equipment is 32 by 4 in. cord with Firestone rims. The steering gear is a Gemmer, worm and wheel type.

Three types of body will be furnished. A five-passenger touring, four-passenger coupe and a five-passenger sedan. One of the body features is the windshield design which merges into the trim rail so as to provide a water-tight joint with the body. The windshield is

wider at the top than at the bottom, which eliminates the usual projection of the front corners of the top.

The body is of 20 gage, deep drawing steel. The doors are hung on concealed steel hinges and equipped with inside and outside handles of offset bar type. The rear fender merges into the body and frame, covering the springs and axle parts. The running boards are covered with linoleum bound with corrugated aluminum molding. The top is a one-man type with five bows designed to harmonize with the body lines. It is covered with pantasote, double lined, and equipped with a plate glass window 26 in. long by 7 in. deep. The side curtains are of the winter type with special rods attached to the doors. The curtains are carried in a pocket in

the back of the front seat, where they are accessible and at the same time are protected against dust and can be packed flat.

The rear cushion dimensions are 47 in. by 21 in. by 9 in. deep. This seat is reclining, and in common with the front cushion is upholstered over Marshall springs. The instrument board is equipped with an oil gage, and an ammeter in an oval panel. The speedometer head is provided with a cowl lamp just above the center, and in another oval panel are the starting and lighting switches. The steering wheel is all walnut. Lamp equipment consists of drum type headlamps finished in nickel and black, side or curb lamps attached to the windshield arms and tail light on license bracket.

## Refinement in Design of Band Brake

**H**ENRY M. CRANE is among the advocates of the band-type brake, providing it is properly constructed. A design incorporating the desirable features of this type of brake, prepared by Mr. Crane is shown in the accompanying cut.

One of the chief advantages of the band brake is the fact that it can be made to bear on almost the full circumference of the brake drum, whereas in the internal shoe-type brake it is difficult to secure an effective contact over more than one-half the circumference. The expanding shoe-type also tends to distort the drum, while there is no such tendency in the band type. Partly because of the large arc of contact, and partly for other reasons it is possible to make a band brake of given capacity much lighter than one of the internal shoe-type.

Smoothness in brake operation depends to a considerable extent upon using a low unit pressure on the braking surface. With the band type a low uniform pressure is readily secured in combination with a brake of adequate capacity and moderate weight. Smooth operation is also facilitated by providing a rigid brake anchorage.

Referring to the cut it will be noted that two narrow drums, placed back to back, are employed, and that two relatively narrow bands are used in place of a single wide band. There are two primary reasons for using this dual construction. In the first place, two narrow drums are less apt to distort due to heating than a single wide drum. In the second place two narrow bands are less likely to bear unevenly than a single wide band. Uneven bearing on a wide band may tend to cause chattering. By placing the brake drums back to back with spacers between and drilling holes in the web of the drum, air is drawn through the space between the drums and assists in cooling them.

A single, rigid anchorage is provided. The link K, attached to the anchorage at one end and to the band at the other, is held against the stop screw J by the spring L. The spring keeps the band lining out of contact with the drum at all times when the brake is in the off position. Two views of the linkage employed for operating the brake are shown. The operating shaft A carries a heavy bent arm, the outer end of which engages the hole C in the link D. The outer end of link D is pinned to the long arm of the lever E. This lever is pivoted on the pin F to which is attached the adjustable link G. The lower end of link G is pivoted in a fitting H riveted to one

end of the brake band. The other end of the brake band is connected to the short arm of lever E. A spring surrounding the link G holds the two ends of the band apart. The fitting H rests against the adjustable stop screw I in its off position. Motion of the long arm of the lever E away from the drum causes the two ends of the brake band to come closer together and brings the braking surface into engagement with the drum.

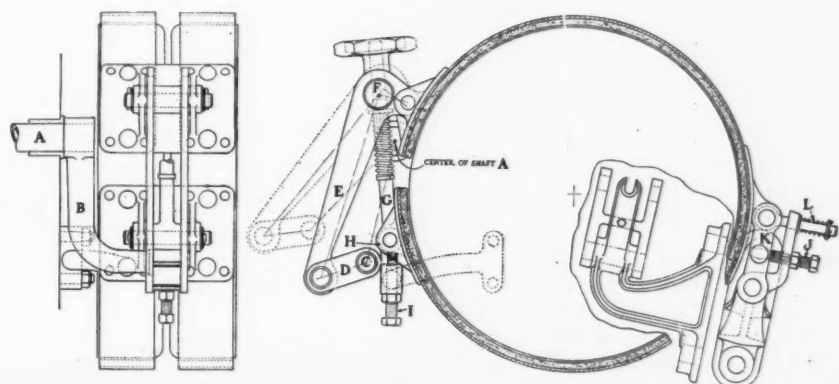
The brake band is rolled to a true circle, consequently, the brake cannot drag if the stops I and J are properly adjusted. It will be noted that the link D remains in a substantially radial position in all positions of lever E. This prevents any tendency there may be for the brake to jam or become self-acting due to the tendency of the braking friction to carry the band around.

It will be noted that the difference in the length of the arms of lever E is sufficient to give considerable multiplication of the pull applied to the long arm. This makes unnecessary other multiplication of pressure than that provided by the normal difference in the length of the two arms of the operating pedal.

The brake band is, of course, stiff enough to clear at all points, but it is sufficiently flexible to insure uniform contact pressure over the entire braking surface and thus distribute wear.

This brake is designed for application to the gearbox. The use of only a light pedal pressure is sufficient to easily lock the wheels of a heavy car even when there is oil on the braking surface. The use of a small quantity of oil on the brake is, in fact, recommended as a means for facilitating smooth operation and minimizing wear.

The brake drum is 12 in. in diameter and each of the two bands is 2 in. wide. The heavy anchorage bracket employed is shown at the right.



Crane design of band-type transmission brake



# Fuel and Lubrication Changes Feature New Premier Model

Fitted with Nelson vaporizer and aluminum piston, which latter has permitted a higher compression ratio. Output and economy of engine increased. Body lines have also been changed and instrument layout improved. Design of connecting rod bearing is somewhat different.

**T**HE Premier 6-D, a new series, incorporates a number of refinements in the engine, largely from the standpoint of more efficient handling of the fuel and better lubrication. The structural parts of the chassis remain the same, and the bodies have been altered only in detail.

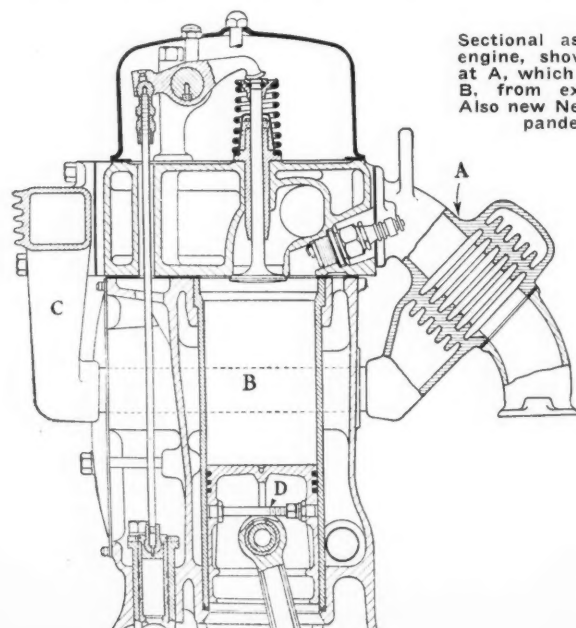
The Nelson vaporizer takes the place of the former water jacketed intake. As shown in the sectional view of the engine, part of the exhaust is carried across the cylinder block through a steel tube contained in a cored passage in the block between cylinders 3 and 4. The gases are conducted by this pipe to the exhaust jacket of the vaporizer, which is located in an elbow in the intake just before the gases enter the cylinder head. The exhaust gases are permitted to flow around the ribbed vaporizing stove in this elbow, and pass back through a separate line to the exhaust pipe, entering it at a point just ahead of the muffler.

The exhaust pipe section has been reduced sufficiently to make up for the additional exhaust passage through the vaporizer. This results in sufficient back pressure in the main exhaust passage to cause a flow of exhaust gases around the vaporizer. Owing to the elbow form of the vaporizer, the heavier particles of fuel are thrown against the outer circumference of the stove, while any of the fuel which is creeping along the walls of the inner radius comes in contact with the stove also. As the corrugations extend entirely around the jacketed elbow, no portion of the intake wall is unheated, which prevents any possibility

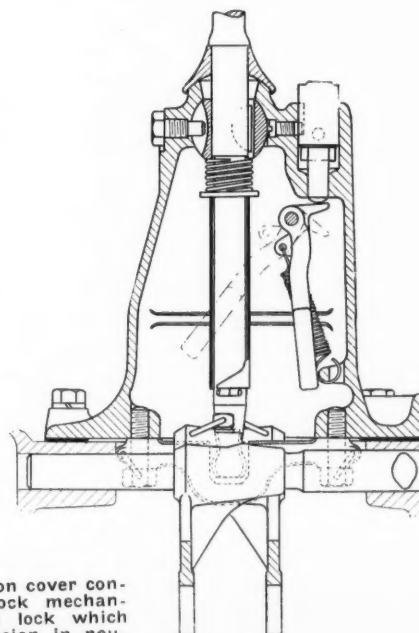
of seepage of raw gasoline along the walls of the intake.

A new piston, also a Nelson patent, is now used, which has made possible an increase in the compression ratio from  $4\frac{1}{4}$  to  $4\frac{5}{8}$ . This has resulted in a higher mean effective pressure and, consequently, greater output and greater economy. The Nelson piston, which is also shown in the section of the engine, is an aluminum alloy type which is expanded to an oval shape while cool. The piston is machined from .010 to .012 in. undersize and then is expanded at right angles to the wrist-pin by the bar or strut shown in the section. It is expanded in this way to 0.002 to 0.00215 in. clearance in the plane of this expander. The theory of the piston is that this expander puts the initial expansion in the piston, so that under heat no further expansion takes place in the plane of the expander. In other words, as the piston becomes warm it goes to a round shape and more completely fills the bore of the cylinder.

A detail refinement in the construction of the cylinder head is the incorporation of a slot in the metal just below the spark plug, so as to bring the cooling water closer to the plug. The increased compression has induced a change in the valve timing. The exhaust is now closed and the inlet opened 4 deg. after top center; the inlet closed 60 deg. after bottom center, in place of 45 deg., and the exhaust opened 52 deg. before bottom center, in place of 45 deg. This timing provides for higher speed of the engine.



Sectional assembly of Premier engine, showing new vaporizer at A, which is fed by steel pipe B, from exhaust manifold C. Also new Nelson piston with expander shown at D



Premier transmission cover containing the interlock mechanism and gearshift lock which locks the transmission in neutral



On the new series there is no groove in the connecting rod bearing, while in the main bearing there is a single circumferential groove all around for continuous oil feed. In the previous series, the connecting rod bearings were grooved, and a different system of grooving was used in the main bearing.

Flanges have been put on the connecting rod bearing bushings so as to provide stiffness and render them independent of the connecting rod bearing caps in this respect. The function of the bearing cap is now only to hold and not to stiffen the bearing. The bearing has been so arranged that the shims are now flush with the edges of the bearing, and, consequently, there is no oil scraping edge at the point where the bearing cap joins the bearing. Another improvement in the oiling system is the increase in size of the oil suction line from 5/16 to 3/8 in. Oil leakage has been further guarded against by placing gaskets under the cap over the valve action. Ten instead of four splines are now used in the Borg & Beck 10 in. clutch. The Cutler-Hammer electric gearshift has been replaced by a hand shift, the electric gearshift being now listed as

special equipment at an extra cost of \$200. The new cover incorporates a shifter lock and also has the interlock integral with it, so that the new head can be assembled to the old transmission case. The construction employed is shown in one of the accompanying cuts.

Spicer universal joints are now employed. The rear axles are a new Timken design. The chassis is lubricated by the Alemite system. There have also been one or two refinements in the fuel system, such as an increase in size of the D-shaped vacuum tank and the substitution of a 1 1/2 for a 1 1/4 in. carbureter.

The body lines have been improved, the enclosed cars now all having a sloping front. The instrument layout has been changed for the sake of better appearance; the curtains in the open cars are now carried in the front doors, and the top is lined. Putting the curtains in the front doors has necessitated placing the tools in another location, and they are now under the front seat. In changing the dash layout, the clock and speedometer have been combined and two instrument board lights are provided instead of one.

## Special Alloys in Exhaust Valve Construction

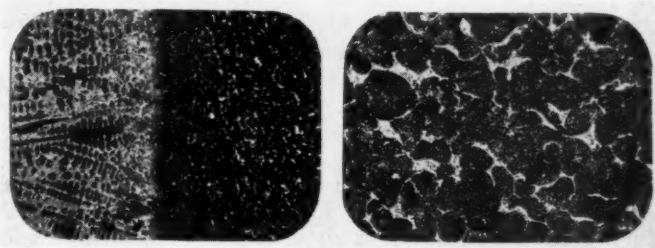
**I**N the recent description of the Wills Sainte Claire car which appeared in the November 10 issue of AUTOMOTIVE INDUSTRIES, it will be remembered that mention was made of a special exhaust valve construction. The various parts of these valves are made of different materials, depending upon the function each part has to perform. The stem and head are made of invar, a nickel alloy steel, while the valve rim is of another alloy steel having high heat-resisting qualities. The tip of the valve, which is subject to the continuous contact of the valve follower, is of chrome-cobalt steel.

The possibilities of welded valves are of interest to automotive engineers and have been made the subject of considerable investigation. Not long ago the Rich Tool Co. submitted a welded valve to the power plant section of the Air Service at McCook Field for tests. The results of these tests showed that this type of valve is likely to be very satisfactory, even under the exacting requirements of air service. The valve is a high chrome-tungsten steel with a seat of heat-resister material welded to it. According to the Rich company the seat material is composed largely of cobalt and chromium, and the alloy is said to possess non-staining and non-oxidizing properties to a high degree.

So far the tests have not included long service runs, but have been more or less of a laboratory nature. Satisfactory results are expected from the former tests, however, according to the material section at McCook Field. The bond between the body of the valve and the material in the seat is said to be very good and should withstand severe service conditions. On tests it was found that the welded-on seat material is resistant in large measure to attack by 20 per cent aqueous sulphuric acid. When the valve was subjected to a highly oxidizing flame at a temperature of about 1350 deg. Fahr., the chrome-tungsten steel of the valve proper scaled perceptibly, but the welded-on seat showed only slight oxidation.

As a result of microphotographic investigation, the weld is shown to be clean, with ample evidence of the alloying of the cobalt-chromium seat with the chromium-tungsten valve steel. The structure at the weld is shown in Fig. 1. The spine-shaped carbide particles on the steel side of the weld are at grain boundaries shown in Fig. 2. These particles are characteristic of an area

which extends back into the steel for about 1/16 in., and they find no counterpart in the deeper general structure of the valve steel. This can be taken to indicate that the depth of the alloy of cobalt and chromium with the steel is equal to about this distance.



(Left)—Structure at weld of valve seat showing the cobalt-chromium alloy on left side and the steel on right  
(Right)—Structure of steel adjacent to weld. Note the spine-shaped carbide envelope. This area probably represents an alloy of the cobalt-chromium with the steel

## Official Motor-Coach Body Revisions in Britain

**T**HE rapid and large development of road auto coaches for 16 and more passengers lends importance to the rumor of a coming revision of the permissible dimension of the bodies for these vehicles. It is anticipated that the Ministry of Transport will order that the overall length must not exceed 25 ft. and the wheelbase 16 ft. (excepting for special vehicles to be considered apart) and the overall body, including overhanging hoods width will be limited to 7 1/2 ft. The gasoline tank will have to be under the rear of the chassis, and all must be equipped with easy get-at-able fire extinguishers and must have fully opening doors.

**I**NCREASED financial aid from the government will be given civil aviation in Switzerland. This will include the assistance of the government in the establishment of an air mail line next year to connect with international services. Provision is made for grants in aid to enable civil aviation concerns to buy modern transport machines.

# Multiplicity of Models Feature British Motorcycle Show

Tendency toward simpler frames, use of pressed steel, ball and roller bearings in engine, and all-chain drive are noted. Overhead valves are gaining in popularity. Many two-stroke engines, some with two cylinders, are employed. Prices are lower than last year but still above pre-war standard.

By M. W. Bourdon

IT need hardly be said that considerable reductions in prices as compared with last year were general at the recent Motorcycle Show at Olympia. On an average these reductions approximate 25 per cent, and prices range from £21 for a 1½-hp. two-stroke single-speed belt-driven lightweight machine to £150 for the most expensive of the 8-hp. two-cylinder machines with four-stroke engines. In the case of the latter type, standard sidecar outfits still leave little remaining out of £200.

One outstanding feature of the show was the large number of new models supplementing existing types. As in the case of British car makers, so with the motorcycle firms; the endeavor which was apparent here and there immediately after the war to specialize upon one model only has been dropped and the pre-war policy of offering a multiplicity of models has been reverted to. Four distinct models is quite normal; five and six is not remarkable; and in one case the range comprises twelve distinct models.

This policy of returning to a big range of types is the result of the trade depression during the past year; makers who were specializing in small machines are endeavoring to cut into the trade in larger sizes, while those who have hitherto specialized in 6-hp. and 8-hp. machines are trying to supplement their output with lightweights.

The further development of the lightweight movement was another feature of the show, and whereas last year users who bought the increasingly popular 2½-2¾-hp. type of machine and fitted a sidecar to it, did so at their own risk, now a score of makers offer this type with a strengthened frame and minor variations for sidecar work. The majority of these lightweight combinations have four-stroke single-cylinder engines, but quite a number have a two-stroke engine rated at 2½-hp., a type which showed up extremely well in the Auto Cycle Union Six Days' Trials last August.

The endeavor to boom motor scooters two years ago has not been entirely given up, three or four firms at Olympia having this type of machine on view; but it has not by any means attained the popularity that was expected, and the total output has been very small compared with anticipations. But the scooter has developed in other directions into an ultra lightweight motorcycle with a 1½-hp. engine in a glorified pedal cycle with spring forks, lower frame and pedaling gear. As a rule, it is supplied with a single gear with belt drive; occasionally it is seen with a two-speed gearset and chain and belt transmission.

A great many of the new models at the show were of what is known as the "sports" type, or, as Triumph—the maker with the biggest motorcycle output in Great Britain—terms this model, "fast roadster." It is usually much

the same as the standard roadster solo machine, but has almost flat and wide handle bars, footrests instead of footboards, exhaust pipes without a muffler, narrower mudguards and a lower frame. In one or two instances, the engine is of a special high efficiency type, but these cases are exceptional.

Overhead valves show distinct signs of increasing popularity, especially for the "sports" models just referred to, though this tendency is by no means only in that direction.

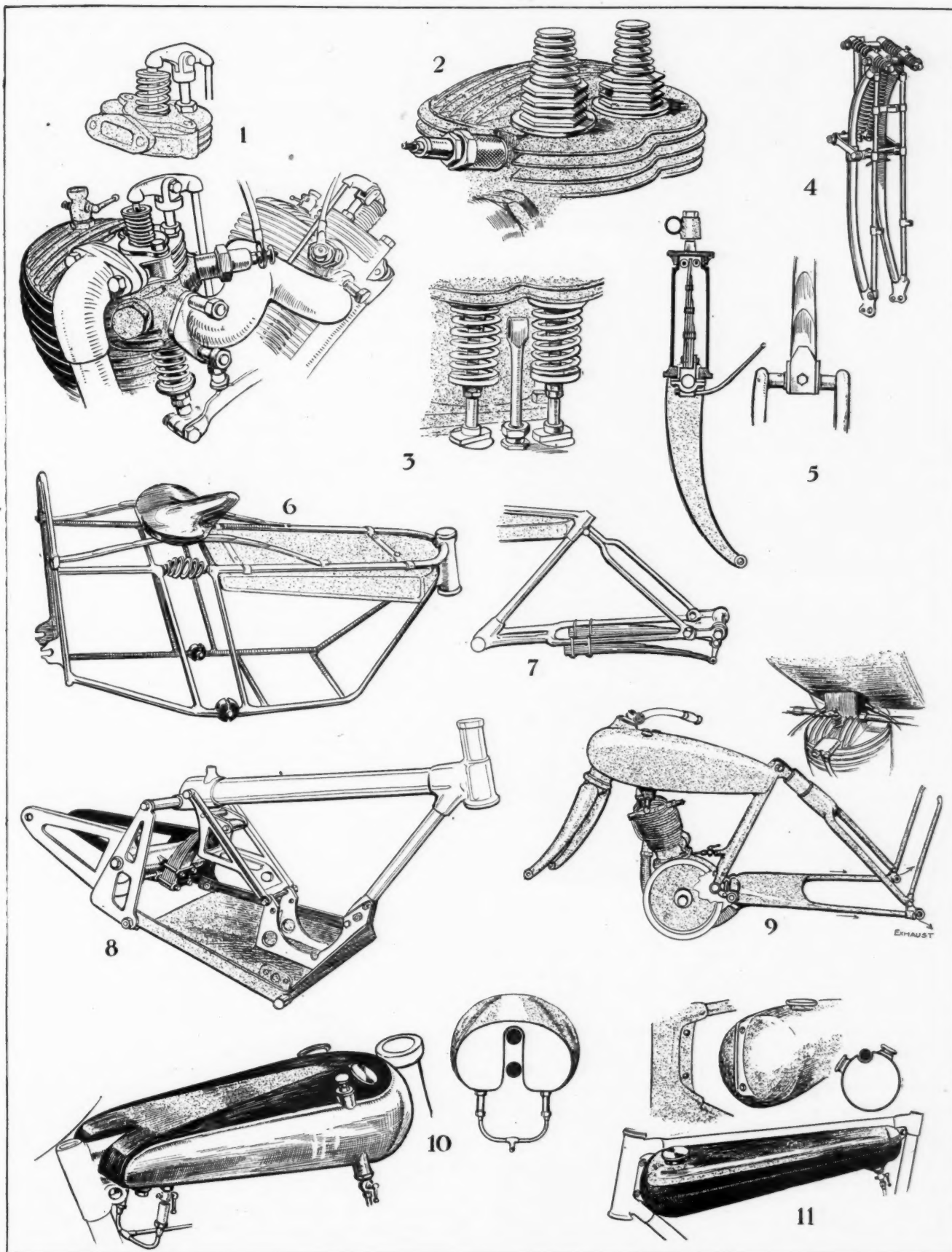
The pressed steel frame is unusual in British motorcycle practice, for there are very few examples of this form of frame construction. Nevertheless pressed steel is being more widely used in certain parts of framework. For example, it occurs here and there in the formation of a tank which displaces the top tube, combining the two functions. The Beardmore precision machine first exemplified this arrangement, and the practice of using pressed sheets for mudguards, combining the back one with a carrier and toolbox, is being continued on additional models of this and one or two other makes. The back stays are also formed of pressed steel in two cases, but, taken generally, frame design remains where it was in the vast majority of machines. The duplex type of tubular frame is, however, more frequently observable; in one machine (the Dot) the bottom part of the frame is some 16 in. wide and has tubular cross members which support the engine and gearset. A development of this will certainly be the enclosing of the engine and transmission by side panels, a feature which is to be seen in isolated cases already.

A notable development indirectly connected with frame design is the rapidly increasing popularity of what is termed the saddle tank, this consisting of a bifurcated unit which is dropped over the upper top tube of the frame and reaches just below the lower top tube (where the latter is used), thus giving the machine the appearance of having a tank displacing top tubing. The appearance is certainly improved by this arrangement. The tank is more or less cylindrical and streamline in form, for the bifurcation is not usually evident except at fairly close quarters. A branched outlet for the fuel is provided, with two taps, the well on one side forming a reserve tank.

Another move in the same direction is to use a streamline tank below the top tube with a depression along the top in which the frame tube is more or less hidden. Both of these systems have a more practical appearance, making the machine appear less "scrappy" than when a square section or straight-sided tank is used.

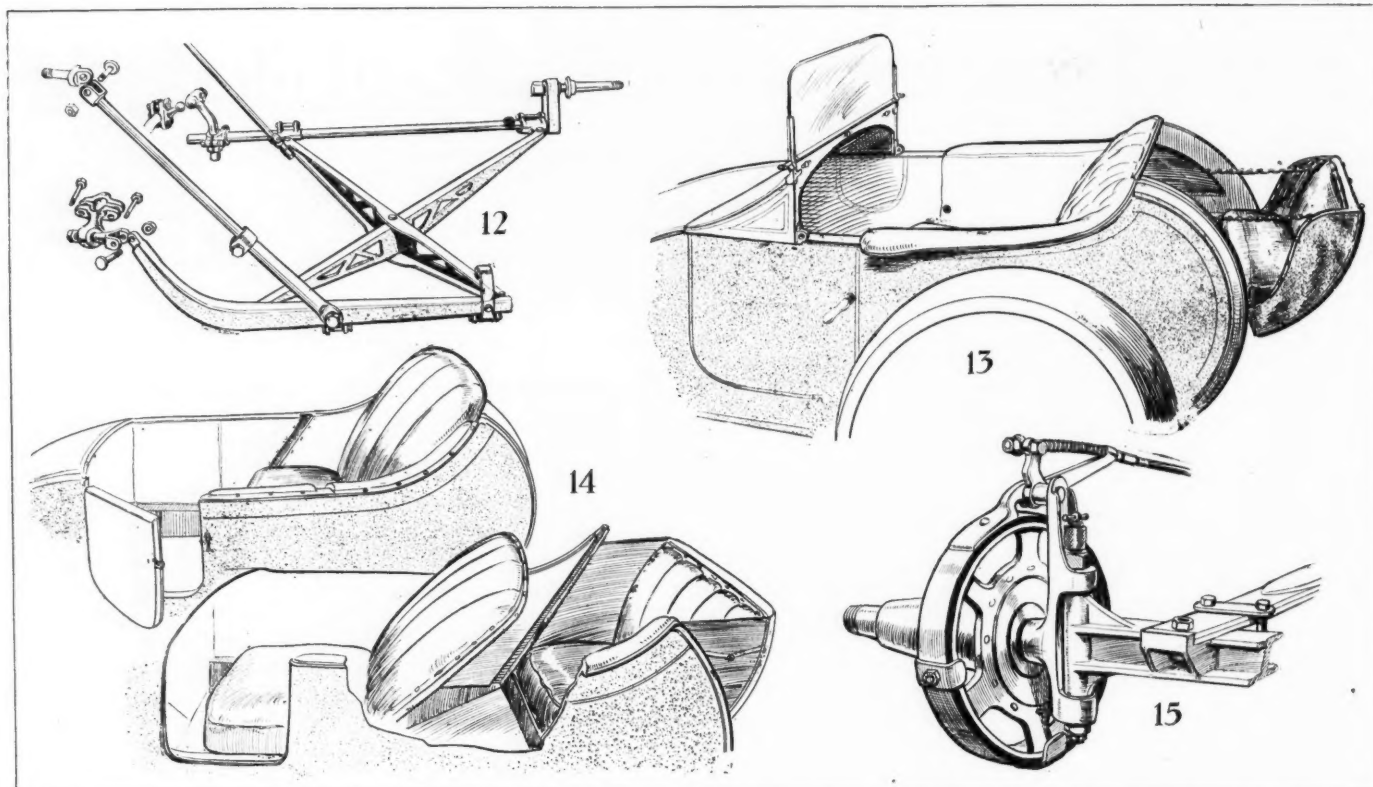
Still referring to frames, welded joints in place of brazed tubes and lugs are gradually becoming more popular, but they still appear only on a small minority of models.





1—Valve gear of Martinsyde engine; has overhead exhausts, and inlets operated by rocking levers. Upper view shows exhaust valve cage detached. 2—Aluminum "fir cone" radiators forming valve caps of new J. A. P. engines. 3—Crankcase breather on new J. A. P. engines ejects oil mist on to valve stems. 4—Popular type (Brampton) of sprung front fork providing both parallel and pivotal movement. 5—Peters spring fork design. Head tube encloses leaf spring attached to pivoted fork. 6—Example of duplex frame; the Dot, which has buffer springs for hinged rear half. Note inverted semi-elliptic saddle springs. Engine and gearset supported by transverse bottom tubes. 7—Simple adaptation of leaf springs to provide flexible rear frame—the Coulson. 8—Composite tubular and pressed steel frame with rear portion sprung on Hagg tandem. Rear seat is carried on pressed steel back mudguard. 9—Peters frame and engine, with detail view of cylinder and tank connection. Rear stays form muffler and duplex exhaust outlet. 10—Example of "saddle" tank. Inset is section in mid length looking rearward, showing location of frame tubes. 11—Streamline tank serving as frame brace, adopted by several makers





12—Pressed steel sidecar chassis with flexible couplings to cycle. 13—Typical sidecar with dickey seat for child. 14—Single seated sidecar convertible to tandem for two adults, as shown in lower view. 15—Simple contracting front wheel brake on three-wheel T. B. runabout. When band brakes are not objected to, the principle might well be applied to car. Actuation is by Bowden cable

Approximately 50 per cent of machines have engines made by the motorcycle manufacturer. On the remainder, the majority have the J.A.P. engines when a four-stroke type is used and the Villiers as a two-stroke. The J.A.P. engines are made in a big range of single and two-cylinder models, all four-strokes, and with an L-head cylinder arrangement. The two-stroke Villiers, on the other hand, is made in one model only, which has a flywheel magneto. It is termed  $2\frac{1}{2}$ -hp. with a bore and stroke of 70 x 70 mm. At the show a development was introduced in this engine. The flywheel magneto was accompanied by a lighting generator.

Apart from proprietary engines, the two-stroke is increasing in numbers, but decreasing in size, and more two-cylinder two-strokes are now on the market. The smallest two-stroke on motor bicycles proper, as distinct from scooters, is  $1\frac{1}{2}$ -hp.; the largest is now a 5-hp. 45-deg. V two-cylinder with a bore and stroke of 70 x 70 mm. The largest single-cylinder two-stroke, the Dunelt, is a 4-hp. engine (85 x 88 mm.), which has an annular space at the bottom of the working cylinder in which reciprocates a lower extension of the piston with an enlarged diameter to form a pumping cylinder. But, generally speaking, the machines above  $2\frac{1}{2}$ -hp. have four-stroke engines.

The increasing use of overhead valves has been mentioned, and the two British makers with the biggest output of motorcycles—Triumph and Douglas—have both adopted overhead valves in one or more of their models. Triumph confines this valve arrangement to the sports or "fast roadster" type, which has a single-cylinder Ricardo-designed engine with two inlet and two exhaust valves in the detachable head operated by exposed push-rods and dual rockers, a feature of the latter being that they are supported in ball bearings. This engine is termed  $3\frac{1}{2}$ -hp., having a bore and stroke of 81 x 87 mm. The inlet valves are of the "masked" type, the seatings of the

valves being countersunk into the surrounding surface of the cylinder head, in conjunction with a cam giving an additional period of lift at each end to compensate for what would otherwise be, in effect, a reduced period of valve opening. For this arrangement the advantage of a steep-sided cam is claimed, although the longer cam actually commences to open and closes finally gradually; consequently it is said that high efficiency is obtained with quiet valve gear.

The Douglas overhead valve engines are, like the remainder of the Douglas line, horizontal twin cylinder motors. The valve rockers in this case are enclosed within aluminum casings extending fore and aft beyond the detachable cylinder heads, the crankshaft being transversely arranged. One maker, Martinsyde—also responsible for the Martinsyde airplanes—has side inlet valves and overhead exhaust valves, reversing an arrangement seen in a few other engines, namely, side exhaust and overhead inlet.

In two of the J.A.P. engines with side valves, the sparking plug position has been altered so that the plug projects from the side of the valve pocket, and the valve caps consist of "fir cone" radiators of aluminum, the object being, obviously, to eliminate the hot spots usually occurring at the valve caps. This scheme is illustrated in one of the accompanying sketches.

The Bradshaw system of oil-cooling has not yet been adopted by any other maker beyond the firm responsible for the Zenith machines; but developments in this connection are to be expected, for a range of engines on this principle is to be made available for motorcycle manufacturers generally. In this engine design, it may be recalled, only the finned cylinder heads project from an enlarged crankcase, the cylinder barrels being exposed within the latter, where they and the pistons are cooled by the large quantity of oil circulated by a gear type pump. In the L head pattern the valve stem, spring,

guides and bottoms of the valve seatings are also exposed to the oil, which itself is cooled by radiation through the large area of the aluminum crankcase.

Motor attachments for pedal cycles have not taken hold of the public, and they are rarely seen except at Olympia. At the recent show there were two firms showing attachments of this type, one of the outfits exhibited also being applied to an invalid chair.

### The Ignition Systems

Magneto ignition still remains universal, a separate unit being general for four-stroke engines, though, as mentioned, the most popular two-stroke—the Villiers—has a flywheel ignition generator, and this scheme is also in evidence on one or two other comparatively unknown makes. Where electric lighting is fitted (invariably, by the way, as an extra), the generator is usually combined with the magneto. The three most popular outfits are the M-L, Lucas and B.T.H. In the M-L arrangement there is only one rotating unit operating within pole pieces of peculiar shape in conjunction with a stationary coil for the lighting circuit. It is truly a combined magneto and lighting generator, and yet the lighting and ignition circuits are entirely distinct. In the Lucas, on the other hand, there are two armatures, one for ignition and one for lighting current, that for the latter passing through the horseshoe magnets above the other, the armatures being intergeared. The B.T.H. system is known as the Spark-light, the current being drawn from the ignition armature during approximately 40 deg. of the latter's rotation, that is, during a part of the period when the armature is not called upon to supply current for ignition. A continuous, as distinct from an alternating current, is generated to charge a small cell, the commutator gear for the lighting current being an attachment to the standard contact breaker plate and designed for fitting to any of the B.T.H. magneto range.

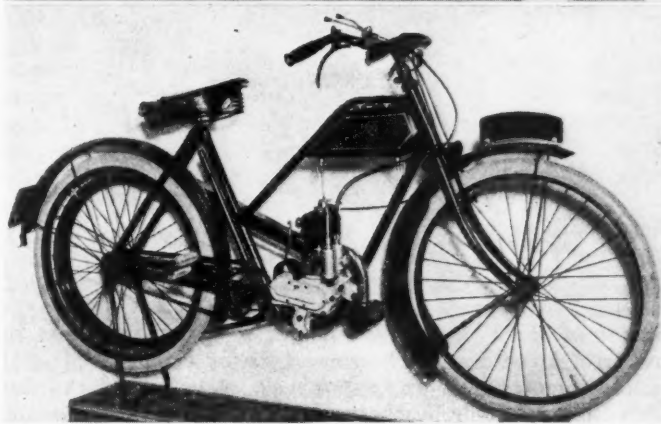
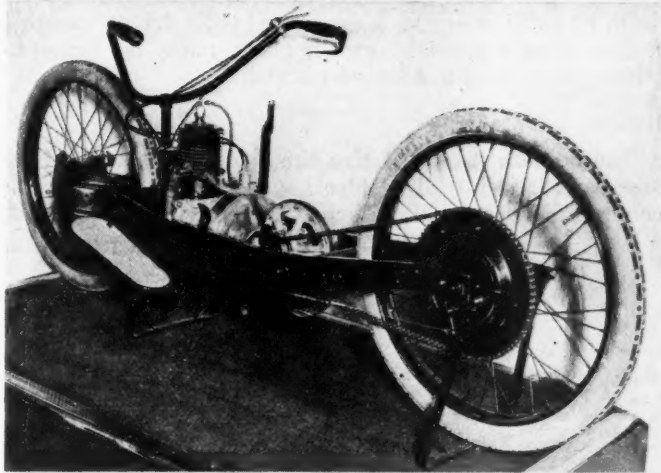
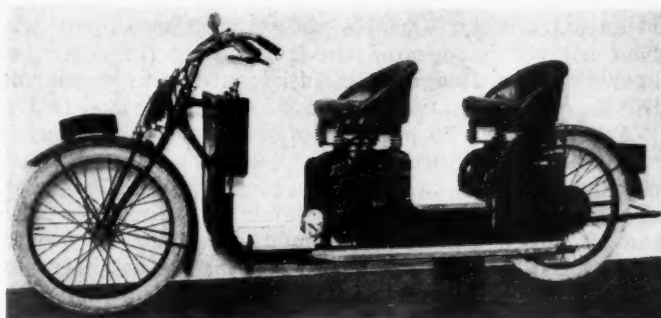
Two-lever carbureters, inferring hand adjustment of the air as well as of the throttle, are used on the majority of machines, and the single-lever type does not appear to have gained in popularity among either manufacturers or users.

Aluminum pistons show a slight gain and also floating wrist pins, but cast iron in the one case and wrist pins secured to the piston bosses in the other still remain predominant. A distinct development is evident, however, in respect of engine bearings. Ball bearings for the crankshaft journals and roller bearings for the big-ends are becoming increasingly popular; even the makers of the J.A.P. engines, who have hitherto held out against ball and roller bearings, have adopted them on new models.

### Lubrication Systems Show Little Change

There is no outstanding change to record in methods of lubrication, the splash system being used on approximately 96 per cent of engines, though methods vary considerably in the system of introducing oil to the crankcase. A mechanical pump for this purpose is used in the majority of the largest engine sizes, the pump working at one-sixtieth engine speed. It draws oil from the frame tank, pumps it to a sight feed, whence the lubricant runs by gravity into the crankcase interior. Semi-automatic systems are most prevalent in single-cylinder engines of the four-stroke type, the normal drip feed having to be occasionally supplemented by charges driven with a hand operated pump.

In two-strokes the "petrol" system (in which a proportion of lubricating oil is mixed with the gasoline) is rapidly being superseded by alternatives, the latter usually taking the form of a drip feed from a sight glass, the oil passing through a branched pipe to the cylinder wall and



16—Reynolds tandem, has  $3\frac{1}{2}$  hp. single cylinder engine under front seat. Transmission by chain through three-speed gearset. 17—Chassis of Ner-a-Car machine, which has pressed steel frame, friction variable gear and  $2\frac{1}{2}$  hp. two-stroke engine. 18—Typical featherweight machine, the  $1\frac{1}{2}$  hp. Hobart. Engine is of two-cycle type with direct belt-drive. Front forks have concealed springing. Sells at £21

to the crankcase; but in a few cases the drip supply is carried to the cylinder wall and to one of the crankshaft journals, thence through a drilled web to the crankpin, the other shaft bearing being of the ball or roller variety and without direct feed.

The unit construction of engine and gearset is exceptional. It is used only on two makes, and those with a small output by comparison with Triumph and Douglas and several others. The usual standard transmission is by primary roller chain from the crankshaft to the gearset and by V belt from the latter to the rear wheel. The all-chain drive is, however, becoming more popular with riders, and consequently few makers of machines of  $3\frac{1}{2}$ -hp. and over fail to offer it at an extra cost. In only about 40 per cent of cases are the chains all-enclosed. In the remainder the secondary chain merely has a guard.

In the smaller sizes, more often than not, an all-belt drive is fitted to the standard machine, though a two or three-speed gearset with chain and belt drive is offered

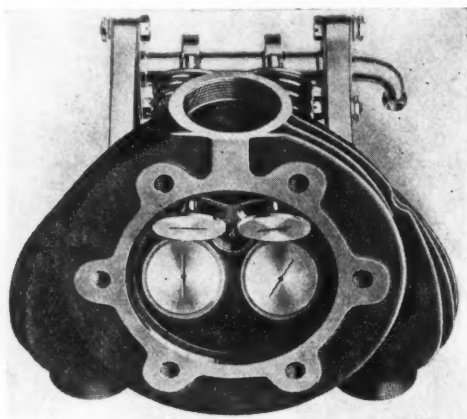


at an extra cost. Variable pulleys with an all-belt drive have not yet disappeared; in fact, two of the dozen best known makers, Rudge and Zenith, continue to standardize this form of transmission on certain of their models.

Approximately 50 per cent of gearsets are supplied by specialists, the Sturmey Archer being by far the most popular in either two or three-speed types. This make of gearset has a single plate clutch with cork inserts for the two-speed box and the multiplate pattern for the three-speed. Kick starters are general but not universal, for in some cases they are offered as an extra. When the transmission is by all-chain, it is usual to embody some form of cushion or shock absorber in the drive, though in a few cases a special form of chain made by Brampton with spring links is adopted instead.

### Brakes

The horseshoe type of tire rim brake is gradually being superseded, mainly by a block operating in a special rim corresponding to a V-belt rim, the block applying to the



19—Underside of detachable cylinder head of four-valve Triumph, showing inlet valve open

inside of the V as a rule, though in a few instances the reverse is the case. The same type of brake, pedal-operated, is most usual on back wheels, either when the final drive is by belt or by chain; but expanding brakes within a drum attached to the rear hub are becoming far more usual, and they appear in a few instances on front wheels also. The external contracting band brake is only used in one or two cases, the internal type being preferred. Only on the most expensive and largest machines, and on merely a few of those, are the front and rear wheels quickly detachable and interchangeable with that on the sidecar.

Electric lighting is not standard on any make, though in 40 per cent of cases it can be supplied as an extra, the generator, as already mentioned, being almost invariably combined with the magneto.

### Passenger Vehicles

Probably 50 per cent of the motorcycles sold in England are sidecar combinations, ranging from 2½ to 8-hp. In the case of the larger machines, the passenger seat and its springing have become more elaborate and even luxurious each year. Sidecar wheels are often separately sprung, as well as the seat, one of the most favored arrangements including a pair of semi-elliptic springs, one of which is located each side of the wheel. Cee springs, quarter-elliptics, cantilevers and semi-elliptics are all used for seat suspension, quarter-elliptics at the front and a pair of Cee's at the back being the usual combination. In view of the general overloading of sidecars by additional passengers, two-seated bodies, usually in tan-

dem form, are frequently observed. At the show a number of makers exhibited this tandem type, and one or two showed "sociables," in which the sidecar passengers are side by side. Single-seaters convertible into tandem bodies were also to be seen in several quarters, and also single-seaters with a small dickey seat for a child. Failing the dickey seat, it is quite usual for the rear panel to bulge rearward appreciably and serve as the hinged top and rear door of a luggage compartment.

Sidecar chassis tend to become more complex than ever, and have usually four, if not five, points of attachment to the cycle frame. In one or two cases a three-point attachment is adopted with flexible couplings, which, with a limited range of movement, relieve both the sidecar and motorcycle frames of a large proportion of road shocks. Screens for sidecars are general, though charged as an extra, and folding tops appear on probably 20 per cent of combinations one meets on the road, though these, again, are not included in the catalog price.

Distinct from the sidecar combination, the three-wheeled cyclecar continues to hold a certain amount of favor. The Morgan is the most popular of this type of vehicle; it is made in several models—some air-cooled, some water-cooled. In all cases the engine is a two-cylinder V, driving through a clutch and propeller shaft to a pair of bevel gears on a countershaft. From this point the transmission is carried through one of a pair of chains leading to the single back wheel, the chains being brought into use by dog clutches on the countershaft.

### Three-Wheelers Elaborate

Some of the three-wheelers are, however, far more elaborate in their specifications, one even including a four-cylinder engine. They have water-cooled engines, and the transmission differs hardly at all from that of a four-wheeled car, in one case the final drive being by worm gearing. But obviously these more elaborate three-wheelers have little to commend them in competition with the small light cars with four wheels. In price, even, they show no advantage, and in this respect they have contemporaries in both directions—sidecars on the one side and light cars on the other. In the case of the Morgan already referred to, which has been a popular make since 1913, this competes directly in its simplest forms with sidecars, one model selling at £150 with an 8-hp. two-cylinder air-cooled engine.

As regards the Olympia Show generally, from a spectacular point of view, it excelled anything of the kind previously held. Ninety-five makes of motorcycles were shown, including 3 American (Reading, Harley and Indian), 1 Belgian and 1 French. The total number of machines on view was 440, and 27 three-wheeled cycle cars in addition. Including accessories and tires, and 45 pedal-cycle exhibits, there were 318 stands in all. As to business done, this was appreciably better than last year, but the revival was not so pronounced as in the case of the car show. Dealers were still very diffident in placing contracts, preferring to wait upon events and order "from hand to mouth," being encouraged in this policy by the announcements of practically all makers that immediate delivery of all models could be guaranteed.

The following summary of retail prices of solo machines will give an idea of the variations since the show of 1920:

	1920	1921
2½-hp. 2-stroke lightweights..	£55-£84	£36-£66
2¾-hp. 4-stroke lightweights..	80-120	52-100
3½-hp. single-cylinder .....	85-140	75-115
4½-hp. two-cylinders .....	120-160	100-120
6 -hp. two-cylinders .....	135-170	105-135
8 -hp. two-cylinders .....	130-180	118-150



# New Machine Grinds Wrist Pin Holes Simultaneously

Double spindle grinder obviates "bell-mouthing" effect and inaccuracy due to great overhang of spindle. Accurate alignment of two holes is assured by method of trueing wheels. Increased production is claimed.

By P. M. Heldt

**S**INCE the advent of the aluminum alloy piston there has been a tendency among engine designers to dispense with bushings in the piston bosses, causing the piston pin to bear directly on the metal of the piston. Several advantages of this practice are obvious. The cost of the bushings is eliminated; the weight of the reciprocating parts is reduced, and the bearing area can be materially increased. It may be that the increase in bearing surface obtainable will practically do away with the need for refitting the bearings during the life of the engine, but if not, looseness in the wrist pin bearings may be eliminated by regrinding the bearings and fitting new wrist pins. Quite lately a few makers of low priced cars seem to have extended this practice of using bearings in unbushed piston bosses to cast iron pistons.

When the bearings of the wrist pin are directly on the metal of the piston it is very desirable that the holes in the piston bosses be ground, so as to obtain at once a good bearing surface which does not require any running in. Grinding of these holes is a rather difficult operation. If the job is attempted with a single spindle grinder, the wheel spindle has to have a great deal of overhang and consequently cannot be made as rigid as would be desirable. Moreover, the wheel has to pass entirely through

one hole, and it has been found that when the wheel is nearly through and the pressure of the work is limited to a narrow width of its face, it will cut into the stock deeper and a "bell-mouthing" effect will result, which is very objectionable.

To overcome these difficulties the Bryant Chucking Grinder Co. has brought out a special double head grinder which grinds the two holes simultaneously. It is a development of the standard machine of the Bryant company. The piston is held in a special chuck mounted on a cylindrical fixture on the bed of the machine. A sectional view of the chuck and fixture is shown herewith. The chuck is mounted on the fixture on ball bearings and is rotated by means of a round belt from the countershaft. The piston is laid into a sort of Vee groove on the chuck, the sides of the groove being turned to conform to the outside diameter of the piston, there being two bearing arcs each about 30 deg. in extent. A clamp made of aluminum extends into the piston from the open end and presses against the inner side of the skirt at about the center of the areas of support on the chuck plate. The reason for the use of aluminum in the clamp is that this makes it easier to balance the chuck and piston. In the drawing the clamp is shown held in position by means of a stud and thumb nut, but this mechanism will be replaced by a cam device to get quicker action. The piston is quickly located in the chuck by means of a hand centering plug which accurately fits a central hole in the chuck and the bored hole in the piston boss. The cam to be used is of the face type, as sometimes used for transmission brakes. There are springs on the clamping studs, the object of which is to permit of a firm grip in spite of slight variations in the thickness of the piston wall.

In the grinding operation the two spindles move simultaneously in the same direction, but in order to remove the pistons the two grinding wheels must be moved apart to clear the clamping fixture. This is accomplished by means of a gear on the shaft of the pilot wheel, meshing simultaneously with a circular rack on the wheel slide and with a rack below it connecting through a rod extending through the center of the wheel slide with the movable slide on the other end of the machine. Thus when the pilot wheel is turned in one direction the two wheel heads are moved apart, and when it is turned in the opposite direction they are moved toward each other. As they approach the position of greatest proximity, the movable slide is clamped at both ends to the wheel slide, this clamping operation being effected automatically by a stop pin on the wheel slide coming up against the lever of the clamping screw at one end of the movable slide, this lever connecting by a link to the lever of the clamping screw at the other end. The stop pin on the wheel slide by

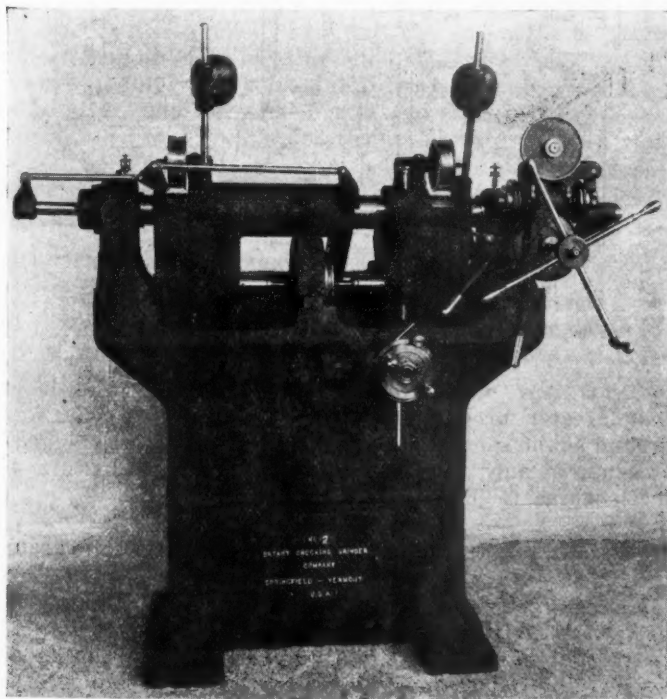


Fig. 1—Bryant No. 2 double head grinder, for grinding wrist pin holes in pistons

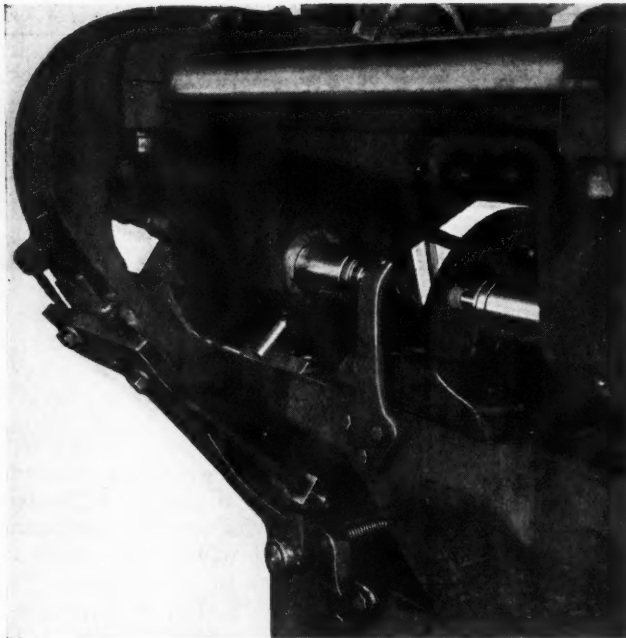


Fig. 2—Wheel heads swung back on cross feed extension for dressing wheels



Fig. 3—Work holding fixture showing method of clamping

means of which this clamping action is produced is adjustable.

For the cross feed the same swinging bar is used as in the regular Bryant grinder. The wheel heads are balanced by two counterweights which are adjustable with respect to the axis around which the wheel heads swing. The counter movement of the two wheel slides is effected by hand, but the traverse during the grinding operation is by power, the change over from hand to power control being made by means of one of the levers in front of the machine. The motion of the wheel slides in grinding is reversed automatically by means of two clutches and reversing stops.

In order to prevent "bell-mouthing" of the ground holes, the wheels are passed only half way through. Concentricity of the holes in the two piston bosses is assured by the method used for trueing up the wheels. The trueing diamond is carried by an arm secured to the grinder bed at the rear directly in line with the work fixture. When the wheels are being trueed the two wheel heads are clamped together, the same as in grinding, and the wheel slide is in the same position in its bearings as when grinding. The motion of the wheel slide for trueing of the wheels is governed by a control plate at the rear of the machine which slides on an extension of the cross feed screw. This extension of the cross feed screw is adjustable, but for any particular job it would be adjusted once for all. The control plate rides on the head of the cross feed screw in grinding and on the head of the extension bar in trueing the wheel. Hand feed is used for rough trueing and automatic feed for fine trueing.

In order to insure absolute parallel motion of the slide, a guide bar is arranged at the rear of the machine by which a lateral arm of the wheel slide is guided. There is a spring plunger in the wheel slide arm which insures that the contact between the wheel slide and the guide bar is always on the lower side.

Each of the two wheel spindles is driven by flat belt from the countershaft. Then there is a separate drive from the countershaft for the feed mechanism, by round belt, and a drive for the work holding chuck by another round belt. This latter drive is controlled automatically by means of a steel cable which winds around the cylindrical part of the wheel slide, so that when the wheel

head is moved out of the way to remove a piston, the chuck is automatically stopped from rotation.

In addition to the advantage of more accurate work as compared with that turned out by a single spindle grinder, for the reasons already explained, it is claimed

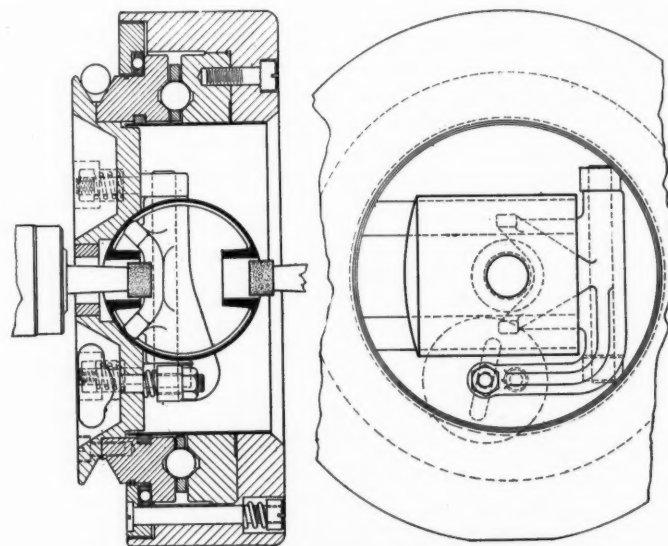


Fig. 4—Sectional view of work holding fixture with piston in place

for this new method of grinding out wrist pin holes that greater production results, because two holes are ground at the same time; the piston needs to be "plugged" or centered only once, and the semi-automatic feature of the machine facilitates the operation.

**TECHNOLOGIC** Paper No. 186, entitled *Oscillograph Measurements of the Instantaneous Values of Current and Voltage in the Battery Circuit of Automobiles*, by George W. Vinal and C. L. Snyder, has been published by the Bureau of Standards. It contains the results of tests of the character indicated by the title, made on five different cars, as well as conclusions drawn therefrom. Copies may be had, for 10 cents, from Superintendent of Documents, Govt. Printing Office, Washington, D. C.



## Buenos Aires Show a Stimulation to Sales

Cars valued at 800,000 pesos sold directly at the exhibition which was featured by a large showing of passenger cars in the high priced class. Argentine body builders present many specially designed bodies suited to native tastes. More than one-half the exhibits were American cars.

BUENOS AIRES, Dec. 5.

COMING as it did in a year of business stagnation, with the Custom House full of rejected merchandise, including some hundreds of automobiles that are gradually being eased on to the market, the enterprise and forethought of the *Automovil Club Argentina* and the *Centro de Importadores de Automoviles y Anexos* in planning the fourth Buenos Aires Automobile Show was worthy of the success that crowned their combined efforts. The Show, under the auspices of the *Automovil Club Argentino*, was held in the *Pabellon de las Rosas* on the *Avenida Alvear*, near the *Palermo Gardens*, and lasted from the 12th to the 27th of November. In view of the depressed state of Argentine industry, the uncertain outlook for the future and the disastrous rise in exchange, it was eminently successful, in the indication it gave of the sources of immediate demand, as well as in the crowds who attended and the actual sale of cars. Perhaps the most significant feature of the show was the positive demonstration of the entrance of Argentine industry into the local automobile market in the building of specialized bodies to accord with the tastes of the wealthy Argentine.

Although trucks and tractors were well represented, the efforts of the organizers were chiefly directed toward the highly finished passenger car. They realized that business conditions prevented any great expansion in the sale of cars in the interior, and that the one point of attack where buying could be stimulated was among the wealthy classes of the city who can afford cars at any time. Consequently, fully half the makes represented were in the high priced class, while practically all the rest were what might be termed the medium price car. The representatives of low priced cars could be counted on the fingers of one hand.

### American Cars Predominate

There were in all 74 cars on exhibition of a total value of 1,200,000 pesos (paper), representing 38 makes. Of these slightly more than half were American, while the rest were scattered between England, France, Germany, Italy and Belgium. The models were mostly 1921 or 1922, though some 1920 models were exhibited.

One feature of the exhibit which was particularly striking was the strong showing made by the local body builders and designers. One-third, or 23 to be exact, of the cars shown had bodies that ranged from rich limousine and sedan designs to a special sport model for a Buick chassis that undoubtedly attracted more attention than any other single feature of the exhibition. Special de luxe bodies for Fords were also shown and favorably received.

Now this emphasis on special body designs and the success that attended it, as well as the abundance of high priced cars exhibited, indicates clearly the policy of the

promoters of the exhibition in appealing to the wealthy buying public of Buenos Aires for this year's sales. As each car was sold a neatly printed card was hung on the windshield of the model giving the name of the owner, thus stimulating the competition among the public to emulate their friends and acquaintances in purchasing new and expensive cars. The general success of the policy of pushing the higher priced models is indicated by the direct sales made at the show. When the results were fully tabulated it was found that 800,000 pesos (paper) worth of cars had been sold directly to the public.

### Should Stimulate Further Sales

These are the direct merchandising results of the exhibition. As to what the indirect results will be, it is too early to forecast an opinion. There are too many other outside factors which at the time of this writing are still undetermined. Certainly the local automobile importers are stimulated. Dealers from the country districts were present, and most of their interest was directed toward the lower priced cars. Whether the stimulation will extend to their market or not depends largely on the success or failure of the harvest that is soon to be gathered. If this proves good and it can be marketed at profitable prices, there will result both a quickening in demand and a lowering in exchange that ought to restore the market for automobiles for the interior to its former satisfactory condition.

There is undoubtedly a tremendous potential market in Argentina for automobiles, trucks, and tractors. As evidenced by the direction of emphasis in the Automobile Show, the one sure market under present unsettled conditions is among the wealthy public who spare no expense in order to have the very latest refinements both mechanically and artistically, in automobile construction. The market for cars in the low priced class has, in the past, been very strong. The present stagnation has hit the medium priced cars the hardest. That there will be a recovery is certain, but the exact time is contingent, as already stated, on the success of Argentina in marketing her products. The bad condition of the roads in the interior, which has been a deterrent in the past to the sale of automobiles, seems on its way toward a solution. Bills are pending in several of the provincial legislatures authorizing the construction of an extensive system of roads, and the Argentine public seems much more appreciative of the necessity of good roads to its future economic development. Next spring a Road Congress is to be held under the auspices of the Argentine Touring Club that has both official and private backing from the most influential sources. The popularization which it will undoubtedly give both to the advantages of good roads and of motor transportation ought to react strongly on the market for automobiles, trucks and tractors.



# Passenger Car Registration Fees Generally Low

Proposed Uniform Vehicle Law would raise fees in most States for this type of vehicle. This would be desirable from the standpoint of the car manufacturer in that more money would be available for road maintenance and consequently more cars would be used. A few excessive fees.

**A**N analysis of state motor vehicle laws as they affect passenger cars reveals the fact that a great majority of the legislative bodies have failed to impose registration fees for this class of vehicle that are high enough to insure proper highway maintenance and a consequent increased use of motor cars.

This statement may seem rather surprising, coming as it does such a short time after the appearance of an article showing that the situation as regards motor trucks is quite the reverse in most states. The condition created apparently is one under which the motor truck owner is forced to bear more than his share of the taxation burdens, while the passenger car owner is let off with a slightly less amount than he should be charged. This is true, however, in only some states. In others the passenger car fees are considerably higher than those deemed fair, but even among these states there are few cases where the fees are high enough to deter the prospective car buyer from becoming a car owner. There is no case of an undisguised attempt to rule certain classes of passenger cars from the roads as was evident in many states when truck legislation was enacted. It is true that seventeen states have, within the past year, increased their registration fees for passenger cars with the result that some have required fees that are excessive and others have decided upon fees that are too low. These changes are shown in the table accompanying this article.

On the surface of things low fees would generally appear to be desirable, and so they are, but they should not be made so low as to prevent proper highway maintenance. This work should be paid for with money secured from automobile taxation and most car owners are, and should be, willing to bear their share of this expense. Good roads are an essential part of the proper functioning of a passenger car and have a direct bearing on sales.

Thus the passenger car industry faces two situations: one caused by excessive registration fees in a few states and the other by the reverse

being true in most states. Such a condition forcefully emphasizes the lack of uniformity that exists in motor vehicle laws. Those who studied the tables and charts presented in connection with the article on commercial cars will no doubt remember the highly diversified methods of determining registration fees and the great variance of fees in different states. It can readily be seen that the same condition prevails in the passenger car laws. There is the same diversity and variance, and while there is not as great a difference between the cost of registering a car in the state having the highest fee and the one having the lowest the difference is consider-

## Changes in State Laws Governing Passenger Cars

This table was prepared from data gathered by the Motor Vehicle Conference Committee.

State	Date new law is effective	Old Fees	New Fees	Old Speed Limits m.p.h.	New Speed Limits m.p.h.
Alabama	No new law	h. p. Fee Under 25.....\$15.00 25-29.....18.75 30-39.....26.25 40 or over.....30.00 Electrics.....20.00 Steam.....25.00	No change	30 m. p. h.	No change
Arizona	No new law	h. p. Fee 25 and less.....\$5.00 25 to 40.....10.00 Over 40.....15.00	No change	City.....10-15 Country.....30	No change
Arkansas	May 1, 1921	Flat rate.....\$10.00	Per h. p.....\$0.25 plus 25c per 100 lbs. gr. wt. of vehicle and "vehicle load."		
California	No new law	Per h. p.....\$0.40 Electrics (flat rate).....5.00	No change	City.....15 Country.....35	No change
Colorado	No new law	h. p. 20 or less.....\$2.50 21 to 40.....5.00 41 or more.....10.00	No change	General.....35 Mountain roads.....20 2% or more grade.....10 On curves.....18	No change
Connecticut	Jan. 1, 1922	Per h. p.....\$0.50	8c per cubic inch or fraction thereof of piston displacement.	City.....30 Country.....20	No change
Delaware	No new law	Per 500 lbs. gr. wt. \$2.00 (Passengers at 125 lbs. each).	No change	City.....15 Country.....30	No change
Florida	Jan. 1, 1922	h. p. Fee 22 or less.....\$5.00 23 to 27.....8.00 28 to 35.....12.00 Over 36.....15.00	Per 100 lbs. gr. wt. of vehicle.....\$0.50	25	30 maximum. On bridges, turns, etc. 15. Passing street railway cars, 5.
Georgia	No new law	25 h. p. or less.....\$11.25 per h. p. over 25......60	No change	30	No change
Idaho	No new law	Wt. of vehicle lbs. 2,000 or less.....\$15.00 2,001 to 3,000.....20.00 3,001 to 4,000.....30.00 Over 4,000.....40.00	No change	City.....20 Country.....30	No change
Illinois	No new law	h. p. 25 and less.....\$8.00 26 to 35.....12.00 36 to 50.....20.00 Over 50.....25.00 Electrics.....12.00	No change	City.....10 to 20 Country.....30	No change

## Changes in State Laws Governing Passenger Cars.—(Continued).

State	Date new law is effective	Old Fees	New Fees	Old Speed Limits m.p.h.	New Speed Limits m.p.h.
Indiana	Jan. 1, 1922	h. p. Fees Less than 25.....\$5 25 to 40.....8 40 to 50.....15 50 or more.....20 Electrics.....5	h. p. Fees Less than 25.....\$5 25 to 40.....8 40 to 50.....20 50 or more.....30 Electrics.....5	City.....10 to 15 Country.....25	No change
Iowa	No new law	Per 100 lbs. wt.....\$0.40 plus 1% of value of vehicle (minimum \$10).	No change	30	No change
Kansas	July 1, 1921	Flat rate.....\$5.00	Minimum.....\$8.00 Plus 50c per 100 lbs. gr. wt. in excess of 2,000 lbs. Electrics, flat rate, \$10.00		
Kentucky	No new law	Per h. p.....\$0.60	No change	City.....15 to 20 Country.....30	No change
Louisiana	No new law	Per h. p.....\$0.25 Minimum fee.....5.00	No change		
Maine	Jan. 1, 1921	h. p. 15 or less.....\$5.00 16 to 35.....10.00 over 35.....15.00	Per h. p.....\$0.25 plus 25c per 100 lbs. actual weight of car plus seating capacity multiplied by 150.	City.....15 Country.....25	No change
Maryland	No new law	Per h. p.....\$0.60 Minimum.....10.00	No change	City.....15 to 20 Country.....35	No change
Massachusetts	No new law	h. p. Fee Less than 30.....\$10.00 30 to 39.....15.00 40 to 49.....20.00 50 and over.....25.00	No change	City.....15 Country.....20	No change
Michigan	No new law	Per h. p.....\$0.25 Per 100 lbs. unladen wt.....0.35 Electrics: Per h. p.....1.00 Per 100 lbs. wt.....0.35	No change	City.....15 Country.....35	No change
Minnesota	April 25, 1921	Flat rate.....\$5.00	1.8% of mfrs. list price during first 3 years. 25% reduction 4th and 5th years. 50% subsequent years. Minimum for car weighing under 1 ton.....\$12 over 1 ton.....15		
Mississippi	No new law	Per h. p.....\$0.50 (Minimum, \$5.00) Electrics.....15.00	No change	City.....15 Country.....30	No change
Missouri	No new law	h. p. Fee 2 or less.....\$2.00 2 to 11.....4.00 12 to 23.....6.00 24 to 35.....10.00 36 to 47.....14.00 48 to 59.....16.00 60 to 71.....20.00 72 and over.....24.00	No change	25	No change
Montana	March 5, 1921	h. p. Fee 23 or less.....\$5 23 to 37.....10 over 37.....15	h. p. Fee 23 or less.....\$7.50 23 to 37.....15.00 over 37.....22.50 Electrics.....15.00	City.....15 Country.....25	No change
Nebraska	No new law	Wt. unladen, 1 ton.....\$10 plus 50c per additional 100 lbs. (Minimum, \$10)	No change	Maximum.....35	No change
Nevada	No new law	Per 100 lbs. factory weight plus weight of passengers at 125 lbs. each.....\$0.35	No change	Reasonable and proper.	No change
New Hampshire	Jan. 1, 1921	h. p. Fee 15 and less.....\$10 16 to 30.....15 31 to 40.....20 41 to 50.....25 51 to 60.....30 over 60.....40	60c per 100 lbs. weight of vehicle and rated load capacity.		
New Jersey	Jan. 1, 1922	h. p. Fee 10 or less.....\$4.50 11 to 29.....7.50 30 or over.....15.00	40c per h. p. up to 29 h. p. 50c per h. p. for 30 h. p. or more.	City.....12 Country.....30	No change
New Mexico	Jan. 1, 1922	Per h. p.....\$0.40	Per h. p.....\$0.40 Electrics.....12.00	Reasonable and proper.	Country.....30 20 in passing, 6 crossing railroad tracks. City.....15
New York	No new law	Per h. p.....\$0.25 Subsequent Fees Yrs. after Mfg. date of list price 3.....\$0.40 4 to 5......20 over 5......10 Minimum 4 cyl.....5.00 6 cyl. or more.....10.00	No change	30	No change

able. This is especially true in cars of the higher price class. These differences are clearly shown in the following table which gives the high and low points reached for cars in five different price classes:

Price Class	High	Low
\$400 .....	\$22	\$5
\$1,000 .....	28	5
\$1,600 .....	40	5
\$2,000 .....	47	5
\$4,000 .....	72	5

These figures would, of course, vary on different cars within each price class, but typical cars have been taken from each of the five groups and the fees computed for them in each state on the basis of existing laws. These typical cars have also been used in determining the fees shown in the table that follows this article. It can be seen from these figures that there is the same lack of uniformity that existed in the truck fees.

Another feature running parallel with an outstanding one in connection with the truck laws is the various methods of determining fees. Nine different methods are in use at present, and while one may be as fair and equitable as the other, the variance is there nevertheless. These methods, with the number of states having each in use are shown in the following table:

Horsepower .....	25
Weight .....	11
Horsepower and weight combined ....	4
Percentage of original cost .....	2
Flat rate .....	2
Weight and percentage of cost .....	2
Horsepower, length of service and number of cylinders .....	1
Per cu. in. piston displacement .....	1
Weight, horsepower, percentage of cost and length of service .....	1

It can thus be seen that about every combination conceivable has been used in securing a basis for determining registration fees. The result has been indicated. Minnesota charges \$72 for registering a car in the highest price class, while not many miles away the same car can be registered in Colorado for \$5. These are extremes, of course, but they serve to illustrate the point.

This condition is not a new one. It has long been felt and some time ago a special committee which was composed of representatives from the American Association of State Highway Officials, National Automobile Chamber of Commerce, American Automobile Association and Highway Industries Association met and drafted the Proposed Uniform Vehicle Law, which if put in effect would equalize fees and restrictions all over the country. The fees imposed by this law would be based

upon the following principle:

Per horsepower .....\$0.25  
Per 100 lb. gross weight ..... .25

Were this law in effect the registration costs for a typical car in each of the five price classes would be as follows:

\$400 .....\$11  
\$1,000 ..... 15  
\$1,600 ..... 16  
\$2,000 ..... 18  
\$4,000 ..... 20

Under present conditions there are 13 states charging more for registering a car in the \$400 class than would be charged under the proposed law; 3 states charge the amount proposed and 32 states charge less than the uniform law fee. In the next price class 8 states charge more, 3 charge the amount proposed and 37 charge less; for \$1,600 cars 13 states charge more, 5 charge the amount proposed and 30 charge less. For the typical \$2,000 car 13 states charge more, 4 charge the amount proposed and 31 charge less; in the highest price class 14 charge more, 3 charge the amount proposed and 31 charge less.

In passing it may be interesting to note that 8 states charge less for registering a car in the highest price class than would be charged for one in the lowest group were the law in effect; conversely, 1 State charges more for registering a car in the lowest group than would be charged for one in the highest under the Proposed Uniform Vehicle Law.

There is also a considerable variance in some states as to the fees charged for the different types of cars. Minnesota again offers the best example of this, for in that State the fee for the highest priced class is \$72 and for the lowest \$12. It is hardly likely that the difference in the wear and tear on the highways between these two classes of cars is enough to justify such a difference in registration costs. It is quite probable that the man who buys an expensive car can as well afford to pay \$72 as the man who buys a lower priced one can afford to pay \$12. Such fees as the former ones, however, only add strength to the convictions of those who still maintain that the automobile is a luxury, and declare, "It isn't the original cost; it's the upkeep." There is bound to be a certain feeling of injustice when the man who buys an automobile has to pay \$72 to the State for the privilege of running it. Such a fee, however, is unusually high, for the next highest fee for such a car is \$56 and from there the decline is gradual until it reaches

### Changes in State Laws Governing Passenger Cars.—(Continued).

State	Date new law is effective	Old Fees	New Fees	Old Speed Limits m.p.h.	New Speed Limits m.p.h.
North Carolina	July 1, 1921	h. p. Fee 26 or less.....\$10 27 to 30..... 15 Over 30..... 20	h. p. Fee 24 or less.....\$12.50 25 to 30..... 20.00 31 to 35..... 30.00 35 or more..... 40.00		
North Dakota	No new law	1st year Per dollar list price \$0.005 Per 100 lbs. wt..... .20 Per h. p..... .10 2nd year 10% reduction. 3d year 25% reduction, and 40% thereafter. Electrics pay \$2 in lieu of h. p. fee. (Minimum, \$5)	No change	City.....10 Country.....30	No change
Ohio	No new law	h. p. Fee 25 or less.....\$8.00 26 to 35.....12.00 Over 35.....20.00 Electrics..... 8.00	No change	City.....15 to 20 Country.....30	No change
Oklahoma	No new law	List price Fee \$500 or less.....\$10 plus \$0.75 for each \$100 over \$500.			
Oregon	Jan. 1, 1922	h. p. Fee 1 to 23.....\$15 24 to 26..... 22 27 to 30..... 28 31 to 36..... 36 37 to 40..... 48 Over 40..... 56	Wt. lb. Fee 1700 or less.....\$15 1701 to 2100..... 22 2101 to 2500..... 28 2501 to 2900..... 34 2901 to 3300..... 40 3301 to 3700..... 47 3701 to 4100..... 55 4101 to 4500..... 62 4501 to 4900..... 71 4901 to 5300..... 79 5301 to 5700..... 88 Over 5700..... 97	Maximum.....30	No change
Pennsylvania	No new law	Per h. p.....\$0.40 (Minimum, \$10)	No change	30	No change
Rhode Island	Jan. 1, 1922	h. p. Fee 15 or less.....\$5 16 to 30.....10 31 to 40.....15 Over 40.....25	Per h. p.....\$0.25 per 100 lbs. gr. wt.. .25		
South Carolina	No new law	Wt. of Car lbs. 2,000 or less.....\$6.00 Per additional 500 lbs..... 2.00	No change		
South Dakota	Jan. 1, 1922	Flat rate.....\$6.00	Mfrs. wt., lbs. Fee under 2,000.....\$12 2,000 to 3,000..... 15 3,000 to 4,000..... 18 4,000 and over..... 30		
Tennessee	No new law	Per h. p.....\$0.50 Electrics (each).....25.00	No change		
Texas	No new law	Per h. p.....\$0.35	No change	15-10	No change
Utah	April 1, 1922	h. p. Fee 25 or less.....\$5 26 to 40.....10 Over 40.....15 Electrics.....10	h. p. Fee 25 or less.....\$10 26 to 40..... 15 41 to 50..... 20 Over 50..... 25 Electrics..... 15	Reasonable and safe.	30
Vermont	No new law	Per h. p. First year.....\$1.00 Second year..... .75 Third year..... .50 Subsequent years... .50	No change	On bridges.....10	No change
Virginia	No new law	Per h. p.....\$0.60 (Minimum, \$10.00)	No change	City.....10 Country.....20	
Washington	No new law	Weight, lb. Fee 1,500 or less.....\$10 Over 1,500..... 10 plus 60c per 100 lbs. additional.	No change	City.....12 to 20 Country.....30	
West Virginia	Jan. 1, 1922	10c per 100 lbs. of weight up to 2,000 lbs. Over 2,000 lbs., 25c per each additional 100 lbs.	Per h. p.....\$0.30 Per 100 lbs. wt. of car and load..... 30 (Passengers at 150 lbs. each).	7-pass. car of 6,000 lbs. gr. wt. City.....15 Country.....35 Others—City.....15 Country.....25	No change
Wisconsin	No new law	Flat rate.....\$10	No change		
Wyoming	Jan. 1, 1922	Per h. p.....\$0.40	h. p. Fee 22 or less.....\$8 23 to 30.....12 31 to 40.....16 Over 40.....20		



## Passenger Car Registration Costs

This table shows the cost of registering a typical car in each of five price classes in all the States under existing laws.

		\$400 Price Class	\$1,000 Price Class	\$1,600 Price Class	\$2,000 Price Class	\$4,000 Price Class
1	Alabama.....P	\$15.00	\$15.00	\$18.75	\$18.75	\$26.25
2	Arizona.....P	5.00	5.00	10.00	10.00	10.00
3	Arkansas.....P-W	11.00	14.00	16.00	17.25	19.65
4	California.....P	9.00	9.60	10.95	11.75	12.50
5	Colorado.....P	5.00	5.00	5.00	5.00	5.00
6	Connecticut.....Disp.	14.16	16.96	19.28	23.04	25.12
7	Delaware.....W	7.00	11.00	13.00	15.00	17.00
8	Dist. of Columbia.....	3.00	5.00	5.00	5.00	10.00
9	Florida.....W	7.50	12.50	15.00	17.50	20.00
10	Georgia.....P	11.25	11.25	12.65	13.90	15.00
11	Idaho.....W	15.00	20.00	20.00	30.00	40.00
12	Illinois.....P	8.00	8.00	12.00	12.00	12.00
13	Indiana.....P	5.00	5.00	8.00	8.00	8.00
14	Iowa.....W-Y	16.00	20.00	27.00	35.00	56.00
15	Kansas.....W	8.00	10.50	13.00	15.50	18.00
16	Kentucky.....P	13.50	14.40	16.40	17.60	18.75
17	Louisiana.....P	5.00	6.25	6.85	7.30	7.80
18	Maine.....P-W	6.85	8.10	9.35	9.80	10.00
19	Maryland.....P	13.50	14.40	16.40	17.60	18.75
20	Massachusetts.....P	10.00	10.00	10.00	10.00	15.00
21	Michigan.....P-W	7.60	8.85	10.35	10.80	11.30
22	Minnesota.....W	12.00	18.00	27.00	39.60	72.00
23	Mississippi.....P	7.50	12.00	13.60	14.70	15.65
24	Missouri.....P	6.00	10.00	10.00	10.00	10.00
25	Montana.....P	7.50	15.00	15.00	15.00	15.00
26	Nebraska.....W	10.00	12.50	15.00	17.50	20.00
27	Nevada.....W	7.35	10.95	12.70	14.25	16.20
28	New Hampshire.....P	9.45	15.45	18.45	21.45	24.45
29	New Jersey.....P	9.00	9.60	10.94	11.76	15.65
30	New Mexico.....P	9.00	9.60	10.94	11.76	12.50
31	New York.....P	5.65	6.00	6.83	7.60	7.81
32	North Carolina.....P	12.50	12.50	20.00	20.00	30.00
33	North Dakota.....P-W-Price	7.75	12.40	16.23	20.94	31.13
34	Ohio.....P	8.00	8.00	12.00	12.00	12.00
35	Oklahoma.....Price	10.00	13.75	17.50	22.75	36.25
36	Oregon.....W	15.00	28.00	40.00	47.00	55.00
37	Pennsylvania.....P	10.00	10.00	10.94	11.76	12.50
38	Rhode Island.....P-W	9.38	12.50	14.33	16.10	17.93
39	South Carolina.....W	6.00	8.00	10.00	12.00	14.00
40	South Dakota.....W	12.00	15.00	18.00	18.00	30.00
41	Tennessee.....P	11.75	12.00	13.67	14.70	15.63
42	Texas.....P	7.88	8.40	9.57	10.29	10.94
43	Utah.....P	10.00	10.00	15.00	15.00	15.00
44	Vermont.....P	22.00	24.00	27.00	29.00	31.00
45	Virginia.....P	13.50	14.40	16.40	17.64	18.75
46	Washington.....W	10.00	13.00	19.00	22.00	25.00
47	W. Virginia.....P-W	13.50	16.95	19.45	21.57	23.78
48	Wisconsin.....Flat rate	10.00	10.00	10.00	10.00	10.00
49	Wyoming.....P	8.00	12.00	12.00	12.00	16.00

the low point of \$5 in Colorado, where the flat rate system is in effect.

The increases that have gone into effect in the past year have ranged from 1 to 440 per cent for a car in the middle price class. The percentages in the other groups would vary, of course, but to no considerable extent. The following table shows the old fees, new fees and percentages of increase for a car in this group in the seventeen states which have enacted new laws:

	Old	New	Percentage of Increase
Arkansas.....	\$10.00	\$11.00	1%
Connecticut.....	13.50	19.45	44%
Florida.....	8.00	15.00	87.5%
Indiana*.....	8.00	8.00	...
Kansas.....	5.00	13.00	160%
Maine**.....	10.00	9.35	...
Minnesota.....	5.00	27.00	440%
Montana.....	10.00	15.00	50%
New Hampshire.....	15.00	18.45	23%
New Jersey.....	7.50	10.94	46%
North Carolina.....	15.00	20.00	33 1/3%
Oregon.....	28.00	40.00	42%
Rhode Island.....	10.00	14.35	43.5%
South Dakota.....	6.00	18.00	200%
Utah.....	10.00	15.00	50%
West Virginia.....	4.50	19.45	332%
Wyoming.....	10.00	12.00	20%

\*No increase for the typical car in this price class.

\*\*A slight decrease for this price class.

From this table it can be seen that even among the states that have increased their registration fees there are ten that have not made the fees as high as they would be under the Proposed Uniform Vehicle Law. It is noteworthy, too, that many of the states increasing

the fees did not raise them as high as they are in other states that previously increased the registration charge.

Looking at the country as a whole it is generally believed that passenger car registration fees are too low. There are instances, of course, where the reverse is true. This serves to clearly show that the outstanding feature of the entire situation is the lack of uniformity. The Proposed Uniform Vehicle Law was set forth in the article dealing with motor trucks as a remedy to the situation, and it is outlined here as a remedy to the passenger car situation, both in the matter of reducing the fees where they are too high and of increasing them where they are too low to permit proper highway development.

It is quite probable that the adoption of the Proposed Uniform Vehicle Law for truck regulation in its entirety would be impractical in some states at the present time. Conditions of the highways and the money necessary to maintain them would be the most important factors entering into such a discussion, for there is no question but that heavy trucks play havoc with flimsy roadbeds. Such is not the case with passenger cars, however. The heaviest of this type of vehicle could scarcely be called destructive on the ordinary type of highway. It is for this reason that there can be found no sound reason for the lack of uniformity that exists. A comparison of the fees for passenger cars and trucks will show that in a few cases the fee for a 5-ton truck in some states is less than it is for a medium-priced passenger car in others. Certainly such a condition would not exist if careful thought and study as to the actual merits of the nation's automobile taxation system had been given.

## Siam Market for Cars and Trucks

DESPITE the increased use of automobiles in Siam the potential market there is not large, according to a report by James P. Davis, American consul at Bangkok. In all of Siam there are not 2000 motor vehicles, and while there will be more sold as time goes on the country is never apt to become one of importance so far as American exporters are concerned.

Poor roads, with chances for improvement small; lack of capital with which to buy cars; high cost of operation; Oriental dislike for new methods and other factors are the chief reasons automobiles are not to be found in large quantities in Siam. A few of the wealthy natives and Americans and Europeans are about the only prospective purchasers. Running conditions, however, are ideal, and cars that were bought in 1908 are still in operation, their owners seeing no real reason for buying new ones.

Bangkok at the present time is overstocked with cars, some 200 unsold cars being on hand, or almost as many as a year's importations. Sale of crops, however, is apt to cause the sale of some of these, but even after they are gone it is believed that many will be sent in from the Straits Settlements, Federated Malay States, India and China, as those countries are also overstocked with cars and they can be bought at low prices.

TESTS made in the mechanical engineering department of the Iowa State College, Ames, Iowa, with five different designs of muffler cutout on a four-cylinder 4 1/2 x 5 1/2 in. engine in a car, showed that the reduction in back pressure due to the use of a muffler cut-out at maximum engine speed and full throttle varied from 2 to 2.5 per cent of the total range of pressures in the cylinder engine, thus indicating that the loss in power and fuel economy due to the muffler are of this order of magnitude.

# 1922 Cornbelt Sales Limited, but Better Business Is Ahead

Farmers are holding corn for higher price with the result that money is scarce. Mr. Beecroft has just returned from making a personal survey of the area and analyzes here conditions as he found them.

By David Beecroft

THE cornbelt area, comprising the States of Iowa, central Illinois, northern Missouri, Nebraska and parts of other States in the Middle West, will come back into the motor car market just as soon as corn climbs from its present price of 28 cents to 40 or 50 cents a bushel. The automotive manufacturer need watch but one thermometer of business in that area—the price of corn. When that all-important product begins to bring prices that are a little less than half what they were a comparatively short time ago, the farmer will begin to unload his stock and he, as well as the town merchants, doctors and lawyers will have money with which to purchase automobiles. Then, and not until then, can the motor car dealer hope to find a market there with a capacity that will anything like equal the market in the past.

The cornbelt is literally stocked to overflowing with corn. Practically the entire crop of 1921 is on the farms, and in some areas 40 per cent of the 1920 crop is still in the hands of the farmer. There are farms where 1921 corn is piled in the open because the building storage capacity is filled with last year's crop.

The net result of such a situation is that the year 1922 will be even a poorer year from the standpoint of motor car sales than was 1921. The farmer was better off when the avalanche of falling agricultural prices first stampeded him. He had ready cash then, but to-day it is all gone and he is heavily in debt. He has not paid the town merchant, some farmers owing this important person from \$300 to \$500. The town doctor and lawyer are waiting patiently for their money and the car dealer is holding his notes. The farmer in the cornbelt has paid for very little that he purchased in 1921.

But the situation is far from being hopeless. As a matter of fact this period of depression is perhaps just what the cornbelt farmer needed. It is serving to bring him back to earth after a flight through undreamed of high prices and consequent luxuries. He was the prey for numerous vultures in the form of stock salesmen and promoters and is learning his lesson. Furthermore this valley in the curve of the automotive business is driving out those unstable firms that established themselves on a somewhat unstable foundation during the boom period. Those substantial automotive dealers who were in business before the war and who have conducted their businesses on a sound economic basis are still a considerable distance from the wall. The situation from their point of view is not particularly bright at the present, but they are fighting and fighting hard, and there is no doubt but what they will come out on top at the end.

An analysis of conditions affecting the cornbelt automotive market reveals the factors that have brought about the present situation. It also shows that the farmer to-day is a different citizen, mentally, than he was a year

ago. He no longer talks of \$1.35 corn, but his mind is on 50 cent corn. That looks big enough to-day and will satisfy him. The farmer has mentally adjusted himself to this new level of prices in the past year and is that much closer to liquidation. He is no longer asking for those conditions that prevailed during the war, but wants only conditions that will make him the substantial citizen he was before the war. That, of course, will be brought about and the sale of motor cars in the cornbelt will again reach a high point.

What brought about the present situation? A year ago the farmer went on a buyer's strike and continued on it most of the year. He has been firm in his refusal to buy. Not all have had money to buy, but many who might have been in the market have kept out of it. The buying capacity of not a few has been restricted by the inability of the country banks to loan money. These banks have tied themselves into a Gordian knot with the farmers and have no funds for loans. Farmers with 160 acres of good corn land worth \$200 an acre, and with a mortgage of but \$2,000 against it, have not been in the market due to lack of bank capital. They will buy on credit, but who can extend them credit? The motor car dealer, except in very isolated cases, cannot. Some country banks have not cashed a farmer's note in sixteen months. The country banks in the Sioux City, Iowa, radius owe the banks of that city \$6,500,000. These Sioux City banks are no different from those in Des Moines and other large population centers of the cornbelt area.

The country banks are largely responsible for their own condition. They got their feet tangled in the speculation period of 1917-1918-1919, when land jumped from \$200 to over \$500 per acre in many sections; when the wealthy agricultural sections were overrun with stock salesmen for a score of new ventures; when farmers went touring with their families to California or Florida in harvest time, leaving the farm with the hired help, and when many new luxuries in rural life were indulged in to the fullest extent. In those long-to-be-remembered days the farmer bought \$10,000 worth of stock in some new meat packing company, or other co-operative venture. He paid \$2,500 in cash and gave his note for \$7,500. The stock salesman took the note to the local banker and sold it at an attractive discount. These banks are still holding many of these documents, and will continue to hold them until the farmer decides to liquidate his corn and meet his obligations.

The banks are not closing on the farmers, for there is too much at stake. It is rumored that the bankers profited well on many of these flotations by the liberal discounts of the stock salesmen, and it is even further rumored that the stock salesmen got their lists of farmers capable of buying stock from many of these same rural bankers.



The bankers generally do not want to discuss the subject.

True, there is another aspect to this farmer-banker situation. The banker is not forcing the farmer to sell corn for fear that such a movement will result in too great a flow from the farmer to the market, which might result in knocking what bottom there is left out of the market. Instead of 28-cent corn the price might be 20 cents or even lower. This is good sound reasoning on the banker's part, and having, perhaps, made it easy for the farmer to get himself into his present financial straits, the banker is going to stay with him and get him out. There is nothing else left to do. In Iowa, for instance, where the State is 95 per cent agricultural, industry loses its grasp if the farmer goes into receivership. There is a general concerted movement to avoid this.

Like everyone else the motor car dealer in this section is hit hard. It is an impossibility for most of the farmers to pay their notes due to these dealers. Many are not even paying the interest as it comes due and yet few are foreclosing. Some are threatening to do so, but even they may decide otherwise. All classes are in pretty much the same boat. They went up together in war days and now they must stand together in days of deflation. The farmer is most in the public eye, and as all industries in the area are dependent upon him he must be saved at all costs.

So, as a result of this rise and fall of the farmer, the cities and towns of the area are affected in like manner. The merchants, doctors, lawyers—most everyone, in fact—are all out of the motor car market, and must remain out until the farmer pays them what he owes them. The farmer cannot come back until he has met his obligations to these people, consequently it might be reasonable to suppose that the first noticeable increase in sales in the area will be among the townspeople rather than on the farms. But that increase cannot be expected too soon. The picture is not a particularly pleasant one, but every cloud has a silver lining, and in this instance the lining is 50-cent corn. That is a possibility, and when it comes it will affect the cornbelt as 20-cent cotton has the Southern States in the last few months, although not quite to the same extent.

It is to the future, rather than to the present, that the automotive manufacturer must look in the cornbelt. Even after the 50-cent corn becomes a reality there must be time to bring about stabilization. The farmer must pay his debts and so must the men of the towns and cities. The year 1922 will not be a golden one so far as motor car sales are concerned, but all these conditions will gradually be removed and business will come back. The area has its face to the future. These days are man-making days. The cornbelt is suffering from a hard siege of recovering pains, but it is on the road to recovery, nevertheless.

The situation in Iowa is typical of what it is in the rest of the district. The statistics of that State are representative of other corn-growing States, and an analysis of conditions there will serve to show conditions of the cornbelt. The motor car dealers of that State are up against what they consider a pretty serious proposition, but they are not backing down. For a good many years the Iowa dealer was looked upon as something of a super dealer. Any State with a motor car for every 5.5 persons must have had some real motor car dealers. Iowa has

had real motor car dealers and still has some left, just as many real dealers as a year ago, but not so many unreal ones. A year ago the State had 4400 car dealers. Perhaps a majority of these were simply bowled off their feet and some of them have not gotten back on them yet. The Iowa dealers' lot was cast in pleasant places. He was not so great a salesman as the 5½-person-per-ratio would lead us to expect. The State had the money and bought cars. When the liquidation move hit the State many of these dealers had no real resistance to combat it or even stand up against it. They got a pretty severe solar plexus.

But Iowa, a year after this move of liquidation, still has a strong organization of motor car dealers, a group that will continue and will be on hand next year and the year following. Two hundred of the 4400 gathered recently in their two-day annual convention in Sioux City. The Iowa Motor Trades Bureau, which is the State dealers' association, had a membership of 1400 a year ago. To-day only 1000 are in good standing, and out of this 1000 only 200 registered at the convention. It was a small showing compared with 800 a year ago, but pretty

fairly represents the dealer situation in the cornbelt. Many sent regrets and openly stated they had not the ready cash and could not afford the trip. Many others are down and out, out of the sale of motor cars, perhaps for good. The mortality of Iowa dealers during 1921, however, has not been so great as might be imagined, for they are mostly running garages and doing a good repair business, but many have gone out of the car selling business. In one town of 2000

population in the eastern end of the State, there were eight car agents a year ago and only three to-day. The present three have garages in the town, but they have given up car agencies and declare they will not take on other lines. This percentage is fairly typical of how car lines have been dropped in all parts of the State. The newcomer dealer of two years ago, a product of war luxury, has been eliminated from the motor field, and while business failures are numerous they are from these ranks of newcomers, leaving old pre-war firms stable and pleasantly conspicuous. The cornbelt is sound. It is coming back.

The farmer has been out of the market this year. Ford dealers in such centers as Marshalltown, Waterloo, Cedar Rapids and Fort Dodge, who in years past sold 40 per cent of their cars to farmers, have sold 10 per cent this year, and in some sections not that many. In sections like the northeast corner, rolling Mississippi territory, where dairy farming is general, farmers have been good buyers, and have paid cash. Some dealers selling high-priced cars have sold three or four to the farmers where they formerly sold 50 or more. Motor truck sales to farmers have almost stopped. One Ford dealer who sold thirty-seven last year has sold ten this year. Tractor sales ceased entirely. Dealers who sold fifty to seventy-five a year ago have not sold one. Many tractors sold in the last two years have not been used. The farmer has worked his horses and saved gasoline. It has been a poor year for the sale of accessories. The biggest jobbers admit business has been from 40 to 50 per cent of what it was last year. To-day the accessory shelves of the dealers are empty or nearly so. The recent "Ask 'Em to Buy" campaign of the Automotive Equipment Association, how-

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**C**ONSIDERED as a possible purchasing unit the cornbelt is not so attractive as a year ago. The farmer was better off when the avalanche of falling agricultural prices first stampeded him. He is on the way to liquidation, however, and the rising price of corn will materially affect the sale of automobiles in the corn-growing states. The boom is over, its results are being felt and the cornbelt will soon be on the road to recovery.

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ever, has electrified the accessory business and awakened the garagemen to the realization that there is still some ready money in Iowa. One Des Moines dealer told of monthly accessory sales on his service floor, of \$3,200, by the foreman on the floor. The "Ask 'Em to Buy" campaign was a big stimulant. The dealer who does not expect to sell many vehicles in 1922 is going after the sale of accessories and repair business with hammer and tongs. The jobbers are co-operating in the effort. One of the biggest Iowa jobbers is putting double the number of road men on for 1922 that he had in 1921. He is putting them on a commission basis instead of straight salary and expects to double the business of this year.

The jobbing trade of Iowa did not escape war expansion. Two years ago there were eighteen jobbers in the State. To-day there are eight, or approximately the same number as in pre-war days. The newcomers have disappeared.

The automotive dealer has a full realization that even in the cornbelt the motor vehicle has not reached its point of saturation, and that the only saturation point of motor vehicles is the saturation point of transportation. The section has its own problems, but statistics indicate the possibility of automotive sales in many lines. Of a population of 2,500,000 in Iowa, 63 per cent live on the farms, of which there are 204,000. The Iowa farmer to-day owns 171,575 acres, according to the Government census, which means that there still are 32,000 Iowa farmers to be sold cars. Statistics do not tell what part of the 24 per cent of the population of the State living in towns under 25,000 population own cars; or what percentage of the 13 per cent of the State population residing in cities over 25,000 own cars. All of these offer future fields for the alert dealer who is preparing as never before to sell to all three of these divisions of population.

#### The Motor Truck Market

As a motor truck market statistics are poor compared with those for motor cars. To-day one out of every eighteen farmers in Iowa owns a truck. The total motor trucks on farms are 10,788 for 204,000 farmers. When the revival sets in many farmers will purchase trucks before cars. The truck is a growing essential chiefly in view of the highway program which has been going on this year. The year 1921 has been the greatest record in the road building history in Iowa. Up to Dec. 1 this year 1406 miles of a 2502-mile primary road system was either completed or under construction. This primary system will connect market centers and county seats. The estimated cost of it is \$20,500,000. From Congress Iowa gets \$2,102,000 as her share of Federal aid for the

fiscal year ending June 1, 1922. Ninety-eight of the ninety-nine counties in the State have been working on this system. Following this primary system is a secondary one for connecting lines. The stimulant to the automotive market that such a highway system is to a State 95 per cent agricultural can scarcely be estimated, and the motor truck will take its place alongside of motor car when this system is well under way.

#### A Field for Tractors

The automotive dealer is not asleep to the possibilities of selling tractors in a corn and oat belt where land is worth \$200 to \$250 per acre, and where farms average 120 to 160 acres. Government statistics place the number of tractors in Iowa at 22,319, or one tractor for each ten farms. The remaining 182 farms are without tractors. The automotive dealer has played his part in selling the 22,319 tractors now in the State. One Iowa tractor manufacturer, the Hart-Parr Co., has 25 per cent of its dealers automotive dealers, and it is estimated that approximately 25 per cent of the dealers of the State sell tractors. Although tractors are literally stagnant at present the tone of the market is optimistic and 1923 is now being chalked up as a better tractor year. November of this year was one of the best farm machinery months of the year in Iowa. The farmer gave evidence of having to come into the machinery market. It is estimated that the farm machinery of the State is at 60 per cent normal to-day, which means that the farmer must start buying soon. The automotive dealer is grasping the broader vision of selling tractors. He no longer sells it as a mere substitute of animal power on the farm, but rather as a production machine for the farm.

The corn growing period is from May 15 to Oct. 3, the date of frosts. The tractor makes it possible to increase the yield per acre of corn by waiting until the ground is ready to plow in the spring and getting the seed sowed in time. It is also possible to plow the ground late in the fall in order to kill weeds and prepare the ground for spring. In these two ways the tractor takes care of the peak of farming. It is truly a production machine for the farmer. What is true of the cornbelt is also true of the winter wheat areas of Kansas, where July plowing is needed, and is also true of the wheat areas of the Northwest. It is in this aspect of handling the peak loads that the dealer sees in the tractor a rapidly increasing sales field and one that logically lies at his door.

The dealer has sold cars to a good high percentage of the farmers in the cornbelt, and he is now setting his house in order to sell to those farmers who do not own trucks or tractors.

### Kiln Drying Course for Home Study

SINCE the announcement of the correspondence-study course, Kiln Drying of Lumber, by the Extension Division of the University of Wisconsin less than two years ago, almost 400 persons have enrolled. This course has been developed through co-operation of the U. S. Forest Products Laboratory. Men from thirty-seven States of the Union and seven foreign countries have taken up this mail instruction to learn more about the art of operating dry kilns, and the proper handling of lumber in general.

This correspondence-study course is an outgrowth of the resident short courses which have proved so successful at the U. S. Forest Products Laboratory, located on the University campus. It was early recognized that much of the information on improved methods of kiln drying

could be taught by mail. Many men who cannot avail themselves of the class instruction in kiln drying given at regular intervals at Madison enroll for the correspondence-study course and so obtain valuable information upon the latest developments in the seasoning of wood.

The course consists of ten assignments, taking up the subjects from the structure of wood, its moisture content, shrinking and casehardening, on through a discussion of the various types of kilns, heat, humidity, circulation, and the operation of kilns. Drying schedules for all of the more common kinds of wood are included.

The text used in this course is specially prepared and in such a form that it can readily be understood by any one with only a common school education.



# South African Tractor Market Demands Study

## Part II

Mr. Bell, in this second article on selling tractors in South Africa, points out the necessity for using careful sales methods. The demand will not be large in the immediate future, but the territories there offer a great potential market and should be prepared for the expansion that will come.

By George B. Bell\*

IN creating a market for tractors in South Africa demonstrations play a very important part, and because of the sparsity of the population and the large distances to be covered, they present some difficulties. Care must be exercised not to "over-demonstrate," as some salesmen have done in the past by speeding up their engines or tampering with their governors. There have also been occasions when salesmen have attempted to haul a greater number of plows than their machines could handle, or to plow too deep. In such cases a poor impression is created upon those interested in the trials, while in the case of over-demonstrating, the buyer is either dissatisfied when he finds that the machine will not keep up to that mark in regular performance, or ruins the machine in attempting to keep up with the demonstration. These things are, of course, fatal to a successful marketing of tractors. The technically qualified expert does not fall into such errors of judgment and will not attempt trials except under favorable conditions, utilizing the model that is best adapted to the particular problem. Manufacturers who are only represented by dealers cannot lay too much stress upon educating their dealers into the policy of tractor service rather than a mere physical sale of machines.

It is also necessary that care be exercised not to give demonstrations except where sales are possible as, otherwise, large sums may be squandered in useless efforts. Before undertaking a demonstration, it should be understood that a purchase will be made if definite results are obtained, with the further understanding that the cost of the demonstration, or a part of it, will be borne by the farmer in the event of a decision not to purchase. There are many farmers who are eager to have free demonstrations, but dealers cannot afford to undertake free plowing on the off chance of making sales.

English tractors are the strongest competitors of American makes. They have the advantage of being admitted into the Union free of duty, as are also tractors from reciprocating Dominions, including Canada. The duty on tractors from other countries, including the United States, is 3 per cent ad valorem, which is based on the Home Consumption Value. Despite the fact that the price of the English tractor is not subject to an exchange handicap and is imported at a cheaper freight rate, the American article has dominated the field.

Several Fiat tractors have been imported, but their

unsuitability for the market and their higher price do not make them strong competitors at the present time. German competition is limited to the Hansa Lloyd tractor, which is imported through a Cape Town firm. Its quoted price is £750, which is about the equivalent of other makes of equal power and size. It is understood that the company selling these tractors in Cape Town will take in exchange South African merchandise at its market value. This competition apparently is not greatly to be feared as there is no service given with the tractor. In this connection it should be stated that American tractors have been shipped to this market perfectly packed, and the question of service and spare parts has been handled practically the same as in the domestic market. In general, in making a shipment of tractors, it is advisable to ship spare parts amounting to 15 per cent of the value of the tractors.

Tractors are handled by three classes of agencies—automobile distributors, agricultural implement and machinery dealers and engineering firms. Distribution by automobile dealers has been altogether unsatisfactory. This is due, in a large measure, to the fact that tractors have been sold merely as machines, without any special attention to the work to be performed, or the type of tractor needed. These firms, which are generally located in the larger cities, carry tractors simply as a side line, and consequently reach a very small part of the farming communities. Distribution through the well-established agricultural machinery houses has been successful, because these houses are intimately acquainted with the needs and methods of the South African farmers, and that they have branch offices and sub-agents in all parts of the Union. Engineering firms as distributors undeniably offer great possibilities, as they should be able to render great service in adapting tractors to the special uses for which they are intended. The average farmer is skeptical to-day as regards the advantage of the machine over oxen, and every failure serves to make it more difficult to market other tractors. It is natural that the farmer is incapable of making an analysis of the reasons for the failure and attributes it to tractors as a class and not to the particular tractor that has not made good. While it would be entirely possible for a manufacturer to educate either automobile distributors or agricultural implement dealers up to a strict regard for a sales policy based on an analysis of the requirements of each particular inquiry, it is admittedly more difficult than securing the co-operation of an engineering house with which such a policy is well understood.

\*Chief Agricultural Implements Division of the Bureau of Foreign and Domestic Commerce. Condensed from an article appearing in this week's issue of Commerce Reports.

It is not good business to try to force upon the distributor a greater number of machines than he believes he can sell to advantage in the first year or two. If the distributor has a well-formed sales organization and the tractor meets with the approval of his trade, he will quickly take advantage of such a situation and decide upon the quantities that he can handle to the best interests of both the manufacturer and himself. It is also best when a contract is made with a distributor that he be furnished gratis with the proper electrotypes, literature and repair lists, all bearing the name and address of the distributor.

Agencies may cover one or several of the natural divisions into which the Union is divided. Capetown, Port Elizabeth, East London, Durban, Johannesburg and Bloemfontein are the leading distribution centers, each serving the surrounding territory. Lourenco Marques is the principal center for Portuguese East Africa, while Salisbury and Bulawayo are the leading centers for Rhodesia.

Distributors purchase tractors outright from the manufacturers, generally being required by contract to maintain a stock of the various models, as well as an adequate supply of spare parts, in order to give good service. Purchases are made both direct from manufacturers and through American commission houses. A 90-day draft is generally drawn by the manufacturer and attached to the shipping documents if the purchase is made direct. Generally, and under normal conditions, if the distributor makes his American purchases through a commission house financial arrangements can be made that are satisfactory.

The credit of the large distributors is of the best, and a good risk. In normal times local sales are on a cash basis or else a large percentage of the purchase price is paid down. At present, when farmers are receiving low prices for their products, and when they are finding it difficult to meet their current liabilities, cash sales are infrequent, and terms must be given in order to turn over stocks, which, while not large, are more than sufficient to supply the present demand. Even when favorable terms are given it is frequently difficult to consummate a sale. Selling tractors at auction is quite common. A light-weight tractor has been sold, complete with plows and spare parts, as low as £100, and it is understood that a fairly large stock of this tractor is held in the Union.

Much improvement cannot be expected until the economic balance of the world is restored and South African farm products are moving steadily to England, Europe, Japan and the United States. However, one of the hopeful signs is that the continental, especially the German, demand is improving, and this will react favorably on the financial position of the farming community. As American tractor prices have been reduced in line with other products, local dealers holding stocks of machines imported at peak prices and low exchange rates have had to take fairly heavy losses.

The future demand for tractors cannot be measured by the present situation or that of 1920. The Union is making steady progress along agricultural lines, and the farmers are becoming more and more progressive. The potential market for the sale of tractors looms large,

and within the next five or ten years the pioneer work that is now being done should bring satisfactory results. There should be a decidedly increased use of the tractor not only in the Union, but also in Rhodesia, Portuguese East Africa, British East Africa, the Belgian Congo and the Southwest Protectorate, where the demand is very small or practically non-existent. No separate statistics are available for these sections, and it is therefore difficult to gage the present demand. American representatives state that comparatively few machines are used in Rhodesia and British East Africa, while there is practically no demand in the Belgian Congo and the Southwest Protectorate. Rhodesia should offer a good field in the course of the next few years, as ranching is carried out there on a large scale. The rich island of Mauritius, with its large sugar estates, is not a potential outlet, according to the representative of a large American company. This is due to the fact that the land is of a lava rock formation, necessitating hand cultivation. The cane is grown in rows between rocks, and even plowing with horses is out of the question. However, it is known that one estate is experimenting with two tractors, in spite of these handicaps.

The subject of advertising is not a complex one, although it is often mishandled. It would be advisable to utilize a qualified advertising agency either independently or in conjunction with an American agency. The names of several of these agencies are on file in the Agricultural Implements Division and will be furnished to those interested on request. There is certainly no necessity of giving the work to other than South African or American agencies.

The tractor trials recently held at Pretoria under the auspices of the Union Department of Agriculture at the Experimental Farm of the Faculty of Agriculture of the Transvaal University College served to emphasize the development of the tractor trade in South Africa. They were a result of the activities of the Tractor Dealers' Association, which realized the need for a more accurate knowledge of the possibilities of the tractor, and that records of costs, etc., based on European or American tests were wholly inapplicable to local conditions.

The trial consisted of plowing eight acres of virgin soil and six acres of old land, and of a brake test. Moldboard plows were used, the minimum depth of plowing required being 5 in. in virgin soil and 7 in. in old soil, although deeper plowing was permissible. There were the usual conditions regarding fuel, lubricants, oil, grease and water. White labor was reckoned at 12s. 6d. per day and colored at 2s. 6d. The purpose of the trials was to determine the efficiency of the tractors considered as plow tractors, and to find the cost of plowing per acre for various types of soils and under the conditions generally prevailing in the Transvaal, not, however, with a view to awarding prizes, but merely for the purpose of securing data and making observations regarding the work of each tractor.

There were three types of tractors entered—wheel tractors, tracklayers and motor plows. In the first class there were six American and two British machines; in the second class five American tractors, and in the third class there was one entrant, the Swedish Avance motor

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**I**MPROVEMENT in the South African tractor market will not be great until the economic balance of the world is restored and South African farm products are moving steadily to England, Europe, Japan and the United States. Now, however, is the time for American manufacturers to pave the way for future sales in this market by systematic and intensive working of the field, so that they may be prepared for the development and expansion which may reasonably be expected.

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plow, which has the motor and plows all on one frame.

Points to which special attention was paid were weight of machine and percentage on driving axles; weight per inch, width of wheel and diameter of wheels; mechanical design and construction; accessibility of engine, gear-box, magneto, etc.; adaptability to various kinds of work; ease of control and safety in handling; ease of turning, and turning radius; facility of attachments; wheel devices; attendance necessary; oil circulation and means of telling whether or not the oil system is functioning; effectiveness of air cleaning and dust-proof construction. The majority of the tractors were fitted with four-cylinder, four-stroke cycle vertical engines, with high-tension ignition and water-cooling systems, although high-speed and low-speed engines were both in evidence. Automatic governors of the throttle type were most in favor, while the oiling systems were either force feed or a combination force and splash feed. The tracklayer type showed to advantage on soft ground, having a better grip with less packing of the soil. The wheel tractors moved over the soft soil quite effectively and have the advantage of less wear on the wheels than the track-laying type, which also absorbed more power. All the tracklayers moved with both tracks on the unplowed land and steering was not affected by the draft. The control of the wheel tractors was affected to some extent by improper hitching and by side draft. All the tractors were fitted with air cleaners, either of the washer or dry-air type. Most of the competing machines worked on paraffin, starting on petrol, excepting two, one using a mixture of the two and another crude oil. All were fitted with

drive pulleys for stationary work, with various degrees of suitability for road haulage.

The results of the plowing tests, as well as technical details regarding the various entries and local prices, are shown in the July issue of the *Journal of Agriculture*, of which a copy is on file in the Agricultural Implements Division of the Bureau of Foreign and Domestic Commerce. The loan of this copy may be secured by addressing a request to the division.

It is unfortunate that costs of oxen plowing under similar test conditions are not available, as they would be of considerable interest. However, the trials have undoubtedly served to focus attention upon the use of tractors and furnished some useful comparative figures. Under present conditions sales will be largely confined to progressive farmers who realize the advantage of the motor-propelled machine, especially in the dry period when the land in the Orange Free State and the Transvaal is sunbaked and cannot be broken with oxen. In other sections of the country the progress of the tractor will be made under more normal working conditions.

While sales for the next few years may not be large, it is believed that South Africa will in the near future offer an excellent market for tractors, all of which will be imported, as local industrial development is not capable of turning out such a highly complex product. Now is the time for American manufacturers to pave the way for future sales in this market by systematic and intensive working of the field, so that they may be prepared for the development and expansion which may reasonably be expected.

## English Char-a-bancs and Motor Buses

**I**N England the char-a-banc or motor bus is taking the place of a private automobile for many people of average means, according to George M. Sprowls, special field representative of The Goodyear Tire & Rubber Company, who was an interested visitor at the Olympia automobile show in London.

The char-a-banc, which carries from 30 to 35 passengers, came into general popularity immediately after the war and has developed rapidly. It is principally used for special excursions to the seashore and countryside. Most char-a-bancs have no tops, but there appears to be a development toward an "all-weather" top. The usual type is split up with long, cross-wise seats, each holding five passengers, with entries by side doors opposite each seat. One rather unusual body exhibited at the show had permanent tops at the front and rear of the car, while the center portion was open. This center portion, however, had windows which could be lowered into the sides and a top that could be rolled back, thus providing either open or closed driving.

Another type of passenger-carrying vehicle which is growing in popularity is the motor coach, which is used for regular trips between towns or for extended tours. These have closed bodies and are quite well appointed. One of the finest cars at the show was a motor coach built to carry 26 persons; the interior was finished in veneered walnut and divided into two compartments. Seats were not arranged in a fixed order, but consisted of leather upholstered chairs arranged as they might be in a drawing room. Each compartment also had a folding table.

Another type had permanent seating arrangements along more conventional lines, with aisles down the center. These seats have high backs and very easy springs, making them unusually comfortable. The bodies are mounted on

pneumatic tires and ride about as easily as a private touring car. This type of car seats about 20 persons.

A more inexpensive type of car was shown, which seats 26 passengers, the whole weighing less than a ton, and selling for \$1400.00.

## Materials Used for Spark Plug Electrodes

**T**HE chemical composition of spark plug electrodes was made the subject of an investigation recently conducted at McCook Field. Chemical analysis indicated that the center electrode is generally pure nickel wire; in some cases manganese was added, probably as a hardener and deoxidizer. In one case the center electrode is a nickel-chrome-iron alloy. The ground electrode in general has the same composition as the center electrode. The tabulation herewith shows the chemical composition of the electrodes analyzed.

	Ni.	Si.	Cu.	Fe.	Mn.	Cr.	C.	P.	S.
A-1	98.49 a	0.04	0.43	0.78	0.26	...	...	...	...
A-2	Nickel electrode too small for analysis.								
A-3	1.27	...	...	...	0.58	0.80	...	0.034	...
B-1	97.66 a	0.06	0.81	1.17	0.30	...	...	...	...
B-2	Nickel electrode too small for analysis.								
B-3	1.06	...	...	...	0.31	0.96	...	0.041	...
C-1	98.78 a	0.08	0.07	0.93	0.14	...	...	...	...
C-2	99.72 a	Trace	0.13	0.15	Trace	...	...	...	...
C-3	...	...	...	...	...	...	...	...	...
D-1	27.85	...	...	49.00	1.23	22.00	...	...	...
D-2	Plain carbon steel.								
D-3	Nil	...	...	...	0.88	...	0.16	0.106	...
E-1	94.96	0.21	0.97	1.61	0.56	...	...	0.093	...
E-2	94.96	0.21	0.97	1.61	2.40	...	...	...	...
E-3	29.01	Believed to be same material as E-1. Too small for analysis.							
F-1	29.01	High nickel steel.	...	...	0.80	...	0.16	...	...
F-2	...	...	...	...	0.54	...	0.21	0.110	0.135
F-3	29.01	...	...	...	0.80	...	0.16	...	...
G-1	97.23 a	0.07	0.36	0.96	1.38	...	...	...	...
G-2	Believed to be same material as G-1. Too small for analysis.								
G-3	97.23 a	0.07	0.36	0.96	1.38	...	...	...	...
H-1	96.69 a	0.08	0.37	0.86	2.00	...	...	...	...
H-2	Believed to be same material as H-1. Too small for analysis.								
H-3	Nil	...	...	...	0.71	...	...	...	0.130

# Distributing Channels Important Marketing Factors

Many independent jobbers can handle the work of distribution in a more efficient manner than can the branch house established by a manufacturer. Financial control does not effectuate a greater efficiency in the distribution of a product. The habits of buying must be considered.

By Harry Tipper

**D**ISTRIBUTION has been the subject of more discussion, perhaps, than any other part of marketing work. Channels, methods and values in distribution have been discussed from every angle, but the discussion has not always recognized the functions of distributing operations, the reasons for their growth and present status, the extent to which they can be altered, and the stable portion of their value in any line of work.

The channels of distribution have been used to describe the generally accepted methods for moving the product from the door of the factory to the user, and most of the discussion in connection with such channels has been in relation to the distributors of various kinds who are concerned with the movement of these products.

The functional value of an organization, buying in order to resell, lies in the benefit to the user of the material, in consideration of the following necessities:

1. The more orderly and efficient physical distribution because of the possibility of buying in larger quantities from a single manufacturer and rearranging in smaller quantities the products of a number of manufacturers.
2. The reduction in the cost of selling because of the distribution of the sale over a number of given items, the more intimate territorial contact with those who buy, and the possibility of more intensive work at less cost.
3. More orderly government of production because of the ability to obligate in advance of sale the stabilizing of credit and the distribution of the speculative features of future estimates.

These are functions pertaining to all concerns engaged in buying products from one group in order to resell them to another group. All of these functions enter into the consideration of the value of the present methods of distribution in connection with any line of business. Each individual function varies in its value in the consideration of any particular line, from any other line. The existence of these concerns continues, however, because of their economic value to the users of products in reducing the cost of distribution and increasing the convenience of buying, which in itself represents a reduction in cost.

In all newer lines of business, as they grow up, the methods of distribution and the channels through which the goods flow to the user arise partly out of the traditional necessities of business in the course of its growth. They are not justified or settled until the business has been absorbed into the fabric of social and industrial life for a sufficient length of time to permit the full sway of competition, to exercise its influence in eliminating the inefficiency.

For centuries the producer of commodities has been dependent upon the merchant for the distribution of those commodities, even when the distributing area was comparatively small and the larger portion of the business confined within narrow limits. As the manufacturing consolidated itself into larger and larger units, requiring a correspondingly larger area for the distribution of the products, the number of distributors grew and the business of merchandising subdivided itself into various lines of activities, the number of these subdivisions changing in accordance with the necessities of the different industrial requirements. This change is still going on. Methods that have no other value except through tradition are being abandoned gradually and methods which have established their value persist in spite of attempts to change them on the part of single organizations or industrial groups.

Habits of buying change very slowly—even where the economic advantage ceases to exist. Before the war, United States transactions with South America were paid through London, because the machinery for exchange had been established.

During the recent world war, the practice ceased to well worn channel was used by all concerns in this country and in others where direct communication could have been established. During the war, the practice ceased to a considerable extent, and it was felt in this country that a new channel could be developed for this work direct with South America. Banks have been established in South American countries, branches of banks in this country, and efforts have been made to create this direct communication. They have not been entirely successful and the creation of this new channel will take years to complete, because the habit of buying and the habit of conducting financial transactions is too deeply ingrained to be eliminated with ease, regardless of the economic advantage of doing so.

The same thing is true in regard to the channels of distribution connected with the movement of any product from the manufacturer to the user. As the industrial condition changes, some of these methods lose their economic value and, in the course of time, must be displaced. They persist, however, for a long time after the values have changed because the habit of buying is not easily transferred into a new channel, and it requires a considerable time to effectuate this change.

This persistence of the habit of buying must be reckoned with by all manufacturers who are considering the present methods of distribution and the advisability of introducing a change. It is possible to consume a great deal of time, effort and money in attempting a change



which will be apparently ineffectual because the strength of the habit has not been reckoned with properly, and the new channel of distribution does not groove itself into the fabric as the manufacturer expects it to do.

The discussion upon distribution has been further confused by the tendency to regard the function of the distributor in accordance with the ownership or the financial control, and not in accordance with the operations performed by him. Thus a manufacturer who has erected branch houses in various parts of the country in order to warehouse and job his own products, is apt to consider that he has eliminated the jobber, whereas he has simply assumed financial control of a number of jobbing houses and put his own men in to handle them. In other words, he has gone into the jobbing business with the idea that he is protecting his market thereby.

The only justification for these branch houses is their ability to perform the operations of buying from the factory and selling to the retailers more efficiently than the regular independent jobber.

Similarly, the jobber who goes into the manufacturing business to safeguard his source of supply, does not realize that he is simply assuming financial control of a producing unit, performing entirely separate functions in business and valuable only if the work of manufacturing can be done more efficiently, price and quality considered, than by those from whom he was accustomed to buy his products on the outside. This fact needs emphasis because the manufacturer has frequently confused the control of his market with the efficiency of distribution and has persisted in entering into the jobbing field or even the retailing field on the supposition that financial control would effectuate a greater efficiency in the distribution of his product. There is no greater fallacy than this and, particularly, in merchandising. Even in manufacturing, notice has been taken by industrial engineers of the dangers involved in the centralized system, too large in its dimensions to permit the proper flexibility and efficiency. Walter M. Polakov dwelt very definitely upon this subject in an address before the American Society of Mechanical Engineers at the last convention.

In the merchandising business and in all operations involved in the distribution of goods, this danger of inefficiency arising out of too highly centralized a system, operating over too large an area, is very apparent. So much of the work of merchandising is due to individual initia-

tive and judgment, individual enthusiasm and contact, and the permeation of a spirit of policy from those in charge, that an attempt to control a large area through branch establishments entering into the jobbing business, and even into the retail sales, is very apt to destroy the efficiency sufficiently to make these operations more costly than the distribution through independent concerns.

It is already admitted in the secret councils of some of the largest organizations dealing with general products that their branch jobbing establishments, owned directly by them, are less efficient than the average jobbing establishment independently conducted. It is not necessary, of course, that these establishments should be inefficient, but the tendency to excessive centralizing of control with the corresponding rigidity and lack of flexibility and contact is very marked; so that there is a direct tendency for these distributors to decrease the efficiency.

The purpose of the distribution channels in connection with any business is to merchandise and physically distribute the goods with the greatest convenience to the user, and with the least possible expense to the final buyer. Many of these systems of distribution have been growing for centuries and have been tried and tested during

the course of many changes in business. Their persistence indicates that they have a definite economic value in the scheme of things regardless of their apparent inefficiency, and their lack of enthusiasm in any one line of work. They have been successfully eliminated in very few instances, and there only where the changes in industry had altered the economic situation in that particular.

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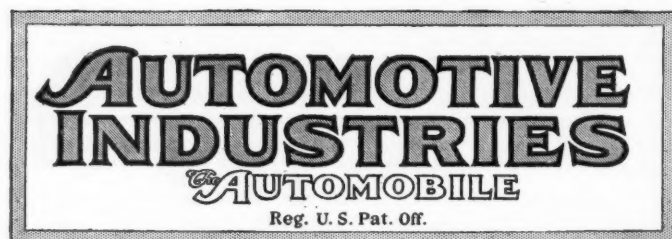
The manufacturer who considers establishing his branches must recognize the fact that he is going into the jobbing business or the distributing business in doing so, and he must arrange to separate these functional developments from the manufacturing developments so that they will indicate their own efficiency in each individual case by the cost and character of their work and they will not be dependent upon the factory to recuperate from the losses created by their own inefficiency in comparison with independent organizations performing the same work.

In the succeeding articles on this subject, fundamental considerations in the distribution of a product will be applied to the different branches of the automotive business and considered in relation to the specific requirements of these branches.

## A Lattice Tension Wheel

**T**HE Thompson lattice wheel has six component parts—rim, felloe, two perforated discs (1/16 in. thick), axially movable tension member splined on the hub and threaded draw ring at the outer end of the hub. The two perforated discs are riveted and clamped to the rim felloe and riveted to the inside of the hub flange and to the axially movable tension member, which is splined on the hub. The perforated disc is put under tension by taking up on the threaded draw ring at the outside of the wheel, or, in other words, expanding the two discs at the hub. The driving torque is said to be distributed equally between the inner and the outer

discs. The arrangement of the perforations is such that the integral lattice spokes are placed in tension by the driving torque both when moving forward and when backing. This wheel can be built so it can be quickly detached at the hub or it may be made with demountable rims. Claims are made for this wheel in respect to light weight, great lateral strength, attractiveness of appearance, ease of cleaning and retention of finish. If one spoke is broken in an accident, a neat repair job can be made by welding, but in case a considerable number of spokes are damaged a new disc must then be substituted.



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## Rebuilding in 1922

**A** GRADUAL, though definite, return to better business conditions heralds the coming of 1922. As business increases, production will grow and working forces will be rebuilt. The manufacturer has before him an unusual opportunity for production economy in the task of rebuilding his organization.

Efficiency in production depends largely upon the fitness of every man for his particular job; upon the opportunity for development which the work gives to the individual worker. In building up the working force again, the employer has a chance to build, not merely in numbers, but in goodwill and production efficiency. Goodwill between employer and employees means lower unit production costs. And goodwill can be generated rapidly by handling men according to the golden rule even though circumstances do not compel.

You feel a glow of pleasure when you receive a Christmas gift from a dear friend, because you know the gift is voluntary and that it carries with it a spirit of brotherhood. As a result your friendship is made

stronger. Contrast this with the feeling of the burglar who receives "gifts" at the point of a revolver. His friendship with the giver is scarcely improved through the transaction.

It is a far cry, to be sure, from the example given to employer and employee relationships. But there is much in the two cases that carries out the simile. The things which workers are able to force from employers when power is on the workers' side fail to promote goodwill to the same extent as those matters which are settled through co-operative effort.

In the period of organization rebuilding which lies ahead, the manufacturer has an excellent opportunity to lay a firm foundation for future industrial relationships in his plant.

## Making Use of Existing Data

**T**HE Forest Products Laboratory is an organization operated by the Government which, as a result of patient research work, secures information of very great value to all users of wood, and the automotive industry is a very large user of wood. Much of the information collected at the laboratory mentioned is not used, however, for the simple reason that it is not widely disseminated, and even those who receive it do not, as a rule, appreciate its value or understand how to use it to advantage. In short, education is needed and education is best obtained by personal contact with those who know and can explain to those who are interested, many phases of subjects which would otherwise remain of little value.

The Department of Agriculture has long appreciated this fact and spends great sums annually, not only in research work, but in educating farmers in the use of knowledge obtained. Much such work is done by county agents of the department in every State in the Union. A similar force of field men representing the Forest Products Laboratory could do great good by visiting manufacturers of wood products and giving them information as to ways of using wood to the best advantage and with minimum waste.

The current appropriation for the Forest Products Laboratory work amounts to less than 25 cents to every \$1,000 of manufactured value, as against six times as much spent for similar work done by the Department of Agriculture for every \$1,000 of value of all agricultural and animal products. The current budget estimate for the laboratory does not carry the funds needed for this educational work. Those interested in availing themselves of it should see that the Sub-committee on Agriculture of the House Committee on Appropriations, and later the Senate Committee on Agriculture, provide the necessary funds.

## Planning Highway Development

**T**HE recommendation of the N. A. C. C. Highways Committee that Congress immediately appropriate \$100,000,000 annually for highway improvement for a term of five years, warrants support from the industry since it would enable highway plans to be laid out on an efficient basis. The sum involved seems like a huge one, but its very size



makes for economy rather than for extravagance.

If this plan were carried into effect state highway departments would be able to plan their work efficiently and economically. When plans can be laid for only one year, with the possibility of radical revision at the end of that time, it is impossible for any business to function properly. Adoption of this recommendation would enable state highway departments to put their work on a sound basis similar to that of any going business enterprise.

## Fuel Vaporization

OF late distillation curves have been used a great deal to show the characteristics of the fuels marketed. Although these curves correctly represent the vaporization of the fuel under distillation conditions, they are often misunderstood or misinterpreted. For instance, if a fuel has an end point of 450 deg., that does not mean that in order to vaporize it its temperature must necessarily be raised to 450 deg. The whole of such fuel could be vaporized at atmospheric temperature if it were exposed in a shallow dish, and if comparatively dry air were blown over it. Water has a boiling temperature of 212 deg. Fahr., but there is surface evaporation at all atmospheric temperatures. Of course, the higher the temperature of the atmosphere the more rapid the evaporation; another factor affecting the rate of evaporation is the moisture content of the atmosphere. For any temperature and pressure there is a saturation point, that is, a limiting proportion of water vapor which the air will hold in suspension. If the temperature is increased the ability of the atmosphere to absorb moisture is increased.

The same laws apply to the vaporization of liquid fuel in air. The boiling point at atmospheric pressure is that temperature at which the fuel passes into the vapor state when in contact only with its own vapors. If the vapors immediately become mixed with air and the air is greatly in excess, as it is in the carbureter of an internal combustion engine, then liquid fuel will pass into the vapor state and remain in that state though the temperature of the mixture of air and fuel is far below the boiling point of the fuel. The minimum temperature at which fuel will remain in the vapor state when mixed with air in any given proportion is known as its dew point.

There is a very large temperature difference between the end point or maximum boiling point of our present day fuels with air in the proportions ensuring high engine output and high fuel economy. For instance, a 15 to 1 mixture of gasoline and air under atmospheric pressure has a dew point of about 95 deg. Fahr., whereas the end point of the fuel is close to 450 deg. Fahr.

As the vaporization of gasoline in fifteen times its weight of air causes a temperature drop of only about 40 deg. Fahr., there would be no difficulty in completely vaporizing even the present high end point gasoline if sufficient time were available. But in an engine running at 2400 r.p.m. the time for one inlet stroke is only 1/80 second and during this infinitesimal period of time the vaporizing action must com-

pletely penetrate to the centres of the globules sprayed from the carbureter nozzle. This penetrating action is the more rapid the higher the temperature of the mixture and it is this fact which calls for energetic heating of the air previous to entering and of the mixture after it leaves the carbureter. The time required for the complete vaporization of the fuel depends also upon the size of the globules delivered by the spray nozzle which increases as the speed decreases. This is the reason why engines can be operated at full speed without much external heat being supplied to the carbureter, whereas, when operated at low speed without heat supply the carbureter or inlet manifold loads up.

## Coordinated Research

THE importance of studying the relation of highways to the traffic they are called upon to bear has long been uppermost in the minds of highway engineers. The advent of the heavy motor truck as a factor in the transportation system of the country has brought forth new problems and in many States well defined efforts are being put forth to build roads designed for this type of vehicle.

There appears, however, to be a need for a more coordinated effort along this line. An instance was discovered recently in which three highway laboratories were working to determine the same result, and under practically the same conditions. This situation serves to emphasize the benefits that would be derived if some sort of a research information service could be put into effect. Such a service would keep departments in the various States advised as to what was being done in other States.

Insufficient data are at hand at present for the highway engineer to determine accurately the types of roads that will best serve the public. Research and more research is necessary if this all-important work is to be carried on to a successful conclusion. State Highway Departments must cooperate with universities in conducting tests and the results of these tests must be made known to all persons interested. Huge sums of money could often be saved in highway construction if accurate data were at hand as to the type of road best suited to the existing conditions. These savings would have a direct bearing upon the automotive industry, inasmuch as more money would be released for highway construction.

## Happy New Year

THE New Year holds different prospects for different individuals. 1922, like 1921, and every other year, will reward workers. The past year, though a period of business depression, did not turn out nearly so badly as pessimists predicted last January.

Broad vision, intelligent analysis, and a recognition of a moral obligation in industry should characterize 1922 in the automotive industry. For the organizations operating on these fundamentals there is steady progress in store during the new year.

AUTOMOTIVE INDUSTRIES wishes you a Happy and Prosperous New Year.

# Makers Confident as Year Closes

## All But One Quarter Will Be Ahead of 1921

### Truck Market Will Show Improvement with General Business Conditions

By James Dalton

NEW YORK, Dec. 27.—One of the most anxious years in the history of the automotive industry comes to a close with conditions vastly more stable than those which prevailed at the beginning of 1921. The essentiality and the popularity of the motor vehicle have been established beyond question in a period of depression. What the future holds for individual manufacturers and dealers is uncertain but there is no uncertainty about the future of the industry as a whole.

#### Few Failures During Year

It is expected that so far as passenger cars are concerned, the first quarter of 1922 will be materially better than the corresponding period last year, the second quarter a little better than in 1921, the third not quite so good, and the fourth considerably better. The truck market will improve with general business.

The most important achievement of the year, next to the production and sale of approximately 1,700,000 passenger cars and trucks, has been the whittling down and balancing of inventories, the writing off of losses and the payment of debts. There have been few failures of real importance. Only a few companies of consequence have been liquidated. Many have been forced to recapitalize and reorganize, but most of them will pull through.

One of the gratifying developments of the year has been the spirit of co-operation shown by the different branches of the industry in supporting the structure as a whole. Merchandise creditors of motor vehicle makers have consistently maintained a constructive policy. This has resulted in the gradual reduction of past due accounts, and collections from manufacturers now are virtually on a current basis.

#### Defaults in Payments Small

Releases on old commitments have come through steadily as the vehicle manufacturer could use them, and parts and accessory manufacturers have moved a large share of the materials they had on hand on Jan. 1 last. There have been few defaults in payments in comparison with the volume of business. Nearly all vehicle companies which were solidly es-

tablished will survive the depression, although it is to be expected that the number of failures in the next few months will be somewhat larger.

The industry will enter 1922 with a feeling of confidence which was lacking twelve months ago. It knows in a general way what it can expect and can trim its sails accordingly. With inventories down, buying in the future will not be on the hand-to-mouth basis which has prevailed for more than a year, although there will be no more piling up of huge supplies.

Passenger car manufacturers are confident that the coming year will be at least as good as the one just closing, and truck makers expect a steadily expanding volume of business as the year advances. Even if there is no expansion of vehicle production, parts manufacturers will have a better year than in 1921 because inventories have been reduced to a point where it is necessary to buy supplies for current needs.

## Stoughton Will Resume Production After Jan. 1

STOUGHTON, Dec. 27.—Pending the erection of an entirely new fireproof building to replace the motor truck factory destroyed by fire early in November, the Stoughton Wagon Co. is remodeling the manure spreader shop for assembling motor trucks. Work on the permanent truck factory probably will be undertaken about April 1.

The truck plant occupied one of the largest buildings of the Stoughton plant and the loss in the recent fire was well over \$375,000. The blanket insurance on the plant is \$1,230,000. Production of trucks has been seriously delayed for a month, but probably can be resumed immediately after Jan. 1. Orders are being booked at the rate of better than one a day.

## Resolution Asks Transfer of Tractors for Road Work

WASHINGTON, Dec. 24.—Congressman Woodruff of Michigan introduced a joint resolution in the House to-day to authorize and direct the Secretary of Agriculture to transfer 1350 5-ton Holt caterpillar tractors from stock now on hand in the war department, to the highway department of the several states. It is proposed that these tractors shall be used in the construction and maintenance of highways.

It is provided that the Secretary of Agriculture may reserve from such distribution not to exceed 10 per cent. of the tractors, for use in the construction and maintenance of national forest roads and other highways in the public land states.

## Truck Producers to Standardize Cabs

### S. A. E. to Discuss Question—Seating Comfort of Driver Considered

NEW YORK, Dec. 24.—At the suggestion of a truck manufacturer having a large distributor and dealer organization standardization of cabs will be taken up for discussion by the motor truck manufacturers' committee of the Society of Automotive Engineers' standards committee. Such a standardization, it is felt, would eliminate present expense and loss of time through making bodies and cabs interchangeable on different makes of truck of the same capacity.

#### Present Situation Uneconomical

Motor truck users and body and cab manufacturers appreciate the present uneconomical situation but as the quantity production of bodies and cabs is impossible owing to the variation in the mounting dimensions for the different types and makes of motor truck chassis they find it impossible to remedy the situation.

The fundamental dimensions which it is felt must be standardized to obtain the desired interchangeability of cabs are the distance from the windshield to the front of the driver's seat and the width of the seat. The latter dimension has been standardized at about 20 in. in practice but the former varies, depending principally upon the angle of the steering column.

It will probably be found necessary to establish two cab widths or seat lengths owing to the larger crew usually carried on the heavier trucks and also to appearance. Instruments will probably have to be attached to a dash furnished as a part of the chassis. This would save a large amount of time in equipping trucks with cabs as no instrument connections would have to be disturbed.

#### Will Eliminate Drivers' Criticism

The locations of the pedals and levers involve difficulties so far as standardization is concerned and a great deal of study will be required. The standardization of the pedals and levers, it is stated, is not absolutely necessary, however, from the standpoint of standardizing the principal cab mounting dimensions.

Standardization of cab dimensions will mean that the seating comfort of the driver will be assured in all cases. This is regarded as eliminating a great deal of criticism on the part of drivers who desire passenger-car comfort.



# Downward Price Movement Started

## Hudson, Cadillac, Buick Make Cuts

### Most Companies Planning Reductions Will Delay Until New York Show

DETROIT, Dec. 27—The first move toward what is expected to be a general reduction and readjustment of prices on passenger car models in connection with the national automobile shows, has been made a little earlier than anticipated.

The first company to announce lower prices was the Hudson Motor Car Co., which reduced all Hudson and Essex models. This was followed closely by the General Motors Corp., which has made very substantial reductions on the various Cadillac models and a cut running as high as \$270 on Buick cars. The Buick cut probably forecasts keen competition with Studebaker. Many other companies are preparing to follow suit but most of them propose to delay action until the opening of the New York show.

The Cadillac schedule, which shows reductions ranging from \$640 on the touring car to \$940 on the suburban sedan follows:

	Old Price	New Price
Roadster .....	\$3,790	\$3,100
Touring car .....	3,940	3,150
Phaeton .....	3,790	3,150
Sedan .....	4,950	4,100
2 passenger coupe....	5,440	3,875
5 passenger coupe....	4,690	3,925
Victoria .....	4,540	4,540
Limousine .....	5,290	4,550
Suburban .....	6,190	5,190
Imperial Limousine...	5,390	4,600

### New Buick Prices

The schedule of prices on the Buick four cylinder models follows:

	Old Price	New Price
Roadster .....	\$935	\$895
Touring car .....	975	935
Coupe .....	1,475	1,295
Sedan .....	1,650	1,395

The prices on the six cylinder line follow:

	Old Price	New Price
Roadster .....	\$1,495	\$1,365
5 passenger touring car	1,525	1,395
3 passenger coupe....	2,135	1,885
5 passenger sedan....	2,435	2,065
4 passenger coupe....	2,325	2,075
7 passenger touring car	1,735	1,585
7 passenger sedan....	2,635	2,375

### Hudson-Essex Schedule

The Hudson schedule follows:

	Old Price	New Price
4 passenger phaeton...	\$1,895	\$1,695
7 passenger phaeton...	1,895	1,745
2 passenger cabriolet..	2,495	2,295
4 passenger coupe....	2,770	2,570
7 passenger sedan....	3,495	3,250
5 passenger touring limousine .....	3,120	2,920

The Essex schedule follows:

	Old Price	New Price
Touring car.....	\$1,195	\$1,095
Coach .....	1,495	1,345
Sedan .....	1,995	1,895

Further Reductions on Page 1294

### PREST-O-LITE CUTS PRICES

NEW YORK, Dec. 23—Reductions ranging from 11 to 20 per cent. on all types of its storage batteries have been announced by the Prest-O-Lite Co. Increased production, it was stated, made possible this decrease. Prices on the line, according to the announcement, are now almost 50 per cent. lower than they were a year ago.

## British Tire Producers Defend Present Lists

LONDON, Dec. 20 (by mail)—A. Johnston, managing director of the North British Rubber Co., Castle Mills, Edinburgh, in discussing band tires, which he points out contain a large percentage of rubber, claims that even to the smallest buyer the prices are 12½ per cent. lower than before the war.

In the case of air tires, he replies to critics, who, noting the fall in raw rubber prices, urge that such tires are too dear, by pointing out that it is cotton and not rubber which figures most in such tires.

(Continued on page 1294)

## Bank Relations Department Will Aid Lexington Dealers

CONNEERSVILLE, IND., Dec. 27—A new subsidiary to be known as the Bank Relations Department has been organized by the United States Automotive Corp., one of the units of which is the Lexington Motor Co. It has been established to make a study of improving relations between bankers and motor car dealers. Frank B. Ansted, president of the corporation, is a banker and several directors of the new company also are bank directors.

Through the bank relations department, Lexington dealers will be aided in their financial operations. In discussing this subject, Ansted said:

"Perhaps at no time in the history of the automobile industry has there been a greater need for business methods in the motor car industry."

### MUTUAL BUILDINGS SOLD

SULLIVAN, IND., Dec. 27—The Mutual Truck Co. buildings were sold to Sherman Osborne of Bloomfield, for \$9,750. C. D. Hunt, receiver, conducted the sale. Osborne says his plans are indefinite but that he anticipates reorganization of the company.

## Overland Reduces Parts Quotations

### Some Show Drop of 50 Per Cent —Apply to Current Models

TOLEDO, Dec. 29—Effective in January the list prices on Willys-Overland parts will be reduced an average of 20 per cent in line with the general reductions in the price of cars.

The new low prices available to the public follow the reorganization step taken recently in the sales department of the Willys-Overland through which several distributors were eliminated from the selling organization and the factory gained direct control over more than 80 per cent of its dealers through factory branches.

The new sales program went into effect on Nov. 1. The last two months have been particularly active ones for the Overland parts and sales departments throughout all the branches.

Along the line of better service and stimulus to selling, the company has advanced the discount to dealers from the customary 15 per cent to 25 per cent. Direct from factory sales of parts has enabled part of the middleman's profit to be eliminated.

Fifty important parts have been reduced 33 per cent while a dozen or more showed a drop of 50 per cent.

The new prices apply only to current models of Overland and Willys-Knight cars because quantity production is possible on them.

In making up the new lists of prices to go into effect this month the cost engineers built up several competitive cars from parts catalogs and figuring the lower prices on cars scaled down the Overland parts prices to meet all competition.

## Kroyer Motors Will Move Its Plant to Los Angeles

LOS ANGELES, Dec. 27—Reports that the Kroyer Motors Co., a \$5,000,000 company engaged in the manufacture of tractors at Stockton, would remove its plant to Los Angeles, are confirmed by J. M. Kroyer, president of the company. The present factory at Stockton covers thirty acres and is devoted entirely to the manufacture of tractors and tractor parts.

The Kroyer company was organized in 1917 after Kroyer and those associated with him had sold the Samson Tractor Co. to the General Motors Corp. Since then he has perfected the Wizard 4-pull tractor.

## Program Completed for Tractor Show

Educational Work Will Be Held  
on Four Days in Different  
Sections

MINNEAPOLIS, Dec. 23—The educational program for the seventh national tractor show, which will be held here from Feb. 6 to 11, has been worked out with the assistance of the faculty of the Agricultural College of the University of Minnesota. Members of the faculties of the educational institutions of the Middle West and Northwest will take active charge of the program. The program is designed to give practical, comprehensive short courses.

The proposed lecture program is as follows:

### Room 1 MECHANICS OF THE TRACTOR. Tuesday, Feb. 7.

- 10—11 Valve Timing.
- 11—12 Bearings.
- 2—3 Carburetion.
- 3—4 Ignition.

- ### Wednesday
- 10—11 Lubrication.
  - 11—12 Slippage lug equipment.
  - 2—3 Overhauling the Tractor.
  - 3—4 Tractor troubles.

- ### Thursday
- 10—11 Valve Timing.
  - 11—12 Bearings.
  - 2—3 Carburetion.
  - 3—4 Ignition.

- ### Friday
- 10—11 Lubrication.
  - 11—12 Slippage lug equipment.
  - 2—3 Overhauling the Tractor.
  - 3—4 Tractor troubles.

### Room 2 APPLICATION OF TRACTOR POWER. Tuesday, Feb. 7.

- 10—11 Plow types, adaptation and use.
- 11—12 Plow adjustment—tractor plowing.
- 2—3 Seedbed preparation. Tillage tools.
- 3—4 Seeding machinery.

- ### Wednesday
- 10—11 Belt Driven Machinery.
  - 11—12 Cultivators and Tractor cultivating.
  - 2—3 Harvesting machinery.
  - Binder troubles.

- ### Thursday
- 10—11 Plow types, adaptation and use.
  - 11—12 Plow adjustment—tractor plowing.
  - 2—3 Seedbed preparation. Tillage tools.
  - 3—4 Seeding machinery.

- ### Friday
- 10—11 Belt Driven Machinery.
  - 11—12 Cultivators and Tractor cultivating.
  - 2—3 Harvesting machinery.
  - Binder troubles.
  - 3—4 Tractor Harvesting.

### Room 3 POWER FARMING PROBLEMS. Tuesday, Feb. 7.

- 10—11 Farm Power.
- 11—12 Uses of a Tractor.
- 2—3 Tractor farming.
- 3—4 Laying out fields for tractor work.

- ### Wednesday
- 10—11 Belts and Pulleys.
  - 11—12 Commercial tractor work.
  - 2—3 Care of the Tractor.
  - 3—4 Depreciation and acre cost of farm machinery.

- ### Thursday
- 10—11 Farm Power.

- 11—12 Uses of a Tractor.
  - 2—3 Tractor farming.
  - 3—4 Laying out fields for tractor work.
- ### Friday
- 10—11 Belts and Pulleys.
  - 11—12 Commercial tractor work.
  - 2—3 Care of the Tractor.
  - 3—4 Depreciation and acre cost of farm machinery.

### TRACTOR FORUM. Tuesday, Feb. 7.

- 11—12 Cost records for a tractor.
- 2—3 Round table on Tractor Farming led by practical tractor farmers.

- ### Wednesday
- 11—12 A motorized farm.
  - 2—3 Round table on Tractor Farming led by practical tractor farmers.

- ### Thursday
- 11—12 Relation of machinery investment to cost of production.
  - Factors affecting cost of production.
  - 2—3 Round table on Tractor Farming led by practical tractor farmers.

- ### Friday
- 11—12 Motor trucks on the Farm.
  - 2—3 Round table on Tractor Farming led by practical tractor farmers.

## Ajax Stockholders to Vote on \$3,000,000 Bond Issue

NEW YORK, Dec. 23—Stockholders of the Ajax Rubber Co. will meet Jan. 11 to authorize the issuance of \$3,000,000 first mortgage, 15 year, 8 per cent. bonds and to ratify an increase in capital from 400,000 shares of \$50 par value to 500,000 shares of no par value. There are outstanding at present 200,000 shares of stock. An additional 200,000 shares will be offered to stockholders for subscription at \$12.50 a share on the share-for-share basis.

A letter sent to stockholders by Horace deLisser, chairman of the board, says that because of expanding business the company has been handicapped by lack of sufficient working capital. He adds that financing arranged through banks and the sale of notes was accomplished by contract which expired Dec. 1. Although for several months prior to that date it was expected the contract might be renewed, the management was notified a short time before the date of maturity that banks and other interests concerned would expect payment Dec. 1. This necessitated the new financing.

## \$191,734 Bid for Assets of American Motors Corp.

PLAINFIELD, N. J., Dec. 23—Receivers of the American Motors Corp. have received from C. B. Penney, representing the "American Motors reorganization syndicate", a bid of \$191,734 including a mortgage for \$55,000, on all the assets of the corporation. The bid provides for an immediate payment of \$10,000; a second payment of \$25,000 on Jan. 15; \$50,000 on Feb. 15 and \$51,734 on March 15.

Creditors of the corporation have been directed by Federal Judge Charles F. Lynch to show cause on Jan. 3 why an order should not be made authorizing the receivers to accept this bid and any other higher bid which may be made.

## Civilian Aviation Gained 20 Per Cent

1200 Aircraft During 1921 Carried  
Approximately 275,000  
Passengers

NEW YORK, Dec. 23—An increase of 20 per cent in civilian flying in the United States this year as compared with 1920 is reported in a review of aviation prepared by the Aeronautical Chamber of Commerce. Twelve hundred aircraft operated by civilians during the past year flew a total of more than 6,500,000 miles and carried approximately 275,000 passengers. The review says:

In the last 12 months aviation has outgrown romance and is now recognized as practical art. The year was crowded with important events, and government, state, municipal officials and transportation experts are agreed that civilian aeronautics must be developed for peaceful transport and as a reserve arm of the national defense.

The U. S. air mail service in 1921 made such a record for efficiency on the transcontinental route that it is recognized as a model for civilian aerial transport the world over. Letters have been delivered in New York two days after casual mailing on the Pacific Coast. The service has an average of 88.82 per cent efficiency, that is, completed trips on scheduled time since it was started in May 1918.

### Societies See Need of Code

Governments of states and heads of Federal bureaus, realizing that fast transport depends upon proper terminal facilities have started campaigns for the acquisition of municipal landing fields. Ordinances regulating aerial traffic have been passed and enforced in scores of municipalities. Almost all large cities have aerial traffic regulations.

State legislatures and municipalities in passing legislation have made it clear that local regulations are temporary and designed to be superseded by the national code when it is effected. The American Bar Association, Aero Club of America, Aeronautical Chamber of Commerce of America, Manufacturers Aircraft Association and the National Aircraft Underwriters Association, the Society of Automotive Engineers and the National Advisory Committee for Aeronautics have recognized the necessity for a national aerial code. Their views have found expression in the Wadsworth-Hicks Bill now before Congress providing for a Bureau of Civil Aviation in the Department of Commerce. This bureau, among other duties, will have supervision over the licensing and registration of all commercial aircraft and pilots and the enforcement of the laws.

### PROPOSE AIRCRAFT MEETING

LONDON, Dec. 20 (By Mail)—It is proposed to hold a conference early next spring to discuss the prospects and development of commercial aircraft. The Government and the Federation of British Industries are principally concerned but the personnel of the committee will be representative of both aircraft constructors and users and will include members of trades more particularly concerned with commercial aircraft supplies.



## Reject Interstate Control of Trucks

### Railroads Opposed to Plan Placing Common Carriers Under Commission

WASHINGTON, Dec. 24—Although admitting that motor truck competition had cut down the volume of their short-haul traffic, Bird M. Robertson, president of the American Short Line Railroad Association, told the Senate Committee on Interstate Commerce that railroad officials had rejected a plan submitted by a member of the House of Representatives to place motor trucks engaged as common carriers under the control of the Interstate Commerce Commission.

He declared that an investigation by railroad officials brought the conclusion that it would not be feasible to amend the interstate act in any way to place that class of carrier under Federal control, as it would probably necessitate an entirely new transportation act. This decision was rejected when statisticians showed that the percentage of interstate business handled by trucks was so small that it would probably not justify Congress at this time in dealing with the matter.

### Trucks Duplicate Service

It is significant to note that Robertson told the committee that motor truck lines were developing an extensive duplication of service, that is placing a much greater burden upon the public than the inconsequential duplication of railroad lines.

Referring to the efficiency of the motor truck as a competitor, railroad officials state:

Motor trucks are rapidly invading the transportation field and duplicating the service rendered by the railroads, under conditions that are most unfair and unjust, and are imposing a substantial burden upon the public. Trucks of that character in most of the States are permitted to compete as common carriers with existing railroads without paying anything for the road building or the upkeep, and they are rapidly destroying the roads. In most of the States they are wholly unregulated, being permitted to operate without schedule and without any regulation as to their charges.

### Can Be No Federal Regulation

In connection with the proposal for Federal regulation of motor truck lines, Robertson said:

We are of the opinion that there can not be any Federal regulation. We have investigated that matter and find that only 4 per cent of their business is interstate; something more than 90 per cent of their business is probably intrastate, and therefore it would be very difficult for the Government to meet that situation.

It is also interesting to note that Robertson referred to the interest which other railroad organizations are giving to this duplication of service. He said:

The railroads must not only build and maintain their own trucks but are taxed heavily to create and maintain the highways used by the trucks; operate upon schedule, and are governed rigidly as to the charges they may make. Under these conditions the motor trucks underbid the railroads on the cream of the local business, though they are under no obligation to operate during bad weather. In this way they not only duplicate existing lines and service, but by decreasing the volume of traffic of the railroads they increase the cost of the service of the rail carriers.

Some states have given their railroad commissions authority to regulate motor trucks, but in most of such states the commissions utterly fail to prevent the duplication of the service and fail to require them to compete upon a fair basis.

If there be any duplicated railroads that do not render a real public purpose, they should be abandoned, and the commission has power to accomplish that result.

### Questions Ability to Control

I doubt the ability of the Government to prevent a manufacturing enterprise from running its own motor trucks and rendering service. I refer exclusively, in my statement, to those doing business as common carriers.

Senator Cummins of Iowa, chairman of the committee, pointed out the difficulty in obtaining reliable data on truck movements. Senator Poindexter told the committee that complaint is beginning to arise at a few points throughout the country of State oppression, or State discrimination between certain rivals of common carriers of interstate business, and inquiry is being made as to why the Federal government does not protect them. The Senator said that he had never discovered that any Federal government had in any way ever endeavored to do anything at all about it.

## Spanish Inquiries Grow with Revision of Tariff

NEW YORK, Dec. 23—Inquiries in increasing number from Spain are reported by the automotive exporters here, in preparation for the revision downward of Spanish automotive tariffs, expected early in the New Year. One large company has received an inquiry from one of its Spanish distributors that in itself is larger than all the shipments of completed cars made from this country during the last few months.

In addition, a statement from the foreign office of the Ford Motor Co. is to the effect that the company's business in Spain in November showed a considerable improvement over previous months. It was also stated that an appreciable betterment had been noted in sales to Latin-America.

### MORE BRANCHES FOR PILOT

INDIANAPOLIS, Dec. 27—The Pilot Motor Car Co. of Richmond, according to information made known here to-day, is preparing for the opening of branches in Chicago, New York, Cleveland, Kansas City, Pittsburgh, San Francisco. These branches will be under the direct control and supervision of the main offices at Richmond.

## Blames Propaganda for Gasoline Rise

### Babson Tells of "Manipulation" —Predicts Lower Prices for Automobiles

MILWAUKEE, Dec. 27—Manipulation and false propaganda are responsible for the recent increase in the price of crude oils and gasoline, according to Roger W. Babson, who spoke at a mass meeting of Milwaukee business and professional men under the auspices of the Association of Commerce. Further, Babson said, 15 cent or 18 cent gasoline may be looked for in the not far distant future, although "ultimately the cost of gasoline will make it prohibitive for use in automobiles."

Discussing the outlook for 1922, Babson said:

Business travels in definite cycles. The first is the period of prosperity; the next, period of decline; the next, period of depression; the next, period of recovery. We are now emerging from the period of depression and getting into the period of definite recovery, headed toward "good times." We have been two years traveling the first periods and it probably will take two years on the return road.

Six of the twelve major industries have hit the bottom and turned the corner on the highway to prosperity. Building material, iron and steel, railroad equipment and the automotive industries have still to pass through the worst of the storm. Building materials, automobiles and iron and steel consequently will sell at lower figures in 1922.

Answering a query, Babson said a cut in freight rates would aid the long trunk lines more than the short lines, because of motor truck competition.

## Earl Soundly Financed, Announcement Says

CHICAGO, Dec. 23—In connection with announcements of production of its new line of cars by Earl Motors, Inc., successor to the Briscoe Motor Corp., it is stated that the company is soundly financed. Its financial affairs are in the hands of John Fletcher, vice-president of the Fort Dearborn National Bank.

A controlling interest is held by the Tilden Estate of Chicago in which is vested more than 50 per cent. of the present 200,000 common shares and which, with associates, is underwriting at \$10 a share a new issue of 200,000 shares and \$2,500,000 five year, 7½ per cent. debenture bonds.

### WICHITA MEETING, FEB. 21

WICHITA, Dec. 24—The Wichita Thresher and Tractor Club announces that the twenty-first annual threshermen's convention of Kansas, Oklahoma and Texas will be held in this city Feb. 21 to 24. Oil and steam tractors, trucks and accessories will be included in the exhibits. Arrangements, also, are in progress to put on a tractor parade.

## South Africa Won By Steam Trucks

### British Firms Making Them Have Captured Majority of Heavy Haulage

JOHANNESBURG, Nov. 8 (*By Mail*)—Steam trucks have taken a firm hold of Johannesburg. British manufacturers, specializing in them, have captured nearly all the heavy haulage in the city as well as in other parts of South Africa. Such trucks are ideal for this country. Coal is cheap and servicing for steam vehicles is not of such a specialized kind as is necessary for motor trucks.

The latest steam truck to arrive is the Leyland, made by the manufacturer of the Leyland motor trucks and buses. Other steam trucks that are in use here in fair quantities are Foden, which has the largest number, Sentinel and Robey. A White truck is now on its way up from the coast and will be the first to come to Johannesburg. The local White representative, who is now in Rhodesia on a tour of inspection, is optimistic about motor truck possibilities in this country.

#### Reo Demonstrates

A feature of the last couple of months has been the sale of commercial vehicles and steam trucks. D. H. Saker & Co. has supplied a number of Reo speed-wagons to various large business houses and municipalities throughout the country. These vehicles are demonstrating their usefulness in town and country. Special bodies have been built for use in the northern Transvaal on mail coach service for carrying passengers and baggage.

Farmers are still complaining about the hard times. They have not managed to sell their wool and maize stands at a low figure, there having been overproduction this year. But the farmer is showing more inclination to buy automobiles just lately than for the past eight or nine months. Car sales have been better in October than any time this year. The Standard Motor Co. of Africa announces the sale of an average of one Nash car daily and the General Garage has also put over about the same number of Dodge Brothers cars. A feature of these sales is the higher proportion of cash transactions.

#### Merger of Distributors

Hupp Garage, Ltd., has been taken over by the Johannesburg Motor Mart and this merger has cleared the air considerably. These two garages, with some of the largest facilities in South Africa, will now be operated as one concern. They are handling Hupp, Cadillac, Allen and Studebaker cars with the exception of the new light six Studebaker, which is being handled almost exclusively in the Transvaal, Orange Free State, and Natal by B. J. Penny & Co., who formerly were Ford dealers here. The Motor Corp. of Africa now handles Ford cars in the Transvaal.

Rains have made the roads nearly impassable in the Transvaal, Orange Free State, Natal and Rhodesia. With the exception of the town highways and one or two main roads around Johannesburg, Cape Town, Durban and the other larger towns the highways are mostly veld tracks that become inches deep in mud after the first rains.

Naturally the South African motorist wants a car that will take him over these roads in the best possible manner and without the help of a span of oxen or donkeys to pull him out of the mud. This is where the American car scores, being light with plenty of power. The three gear forward system is also better for this country, as the speed given by a fourth gear cannot be used. Pulling is wanted and high average speed.

### Wright Assets Exceed Liabilities, \$355,000

PHILADELPHIA, Dec. 27—Assets of the Wright Roller Bearing Co. for which receivers have been appointed in United States court, are estimated at \$884,000 and the liabilities at \$529,000. W. B. Stratton of New York, one of the receivers, represents the interests of John N. Willys who is the largest single stockholder.

The firm's difficulties began, it is stated when notes amounting to \$400,000 given to Willys when he advanced money for plant extensions were sold by him to interests which demanded payment.

The receivers had been given instructions to continue operations and it is expected the difficulties of the company will be straightened out.

### Sanford Supplements Line With New 1½ Ton Truck

SYRACUSE, N. Y., Dec. 24—The Sanford Motor Truck Co. is bringing out a 1½-ton model equipped with electric starting and lighting, pneumatic cord tires and capable of sustaining a speed of 25 m.p.h.

This will supplement its line of trucks which are made in capacities of 2½, 3½ and 5 tons. The truck is designed by J. E. Gramlich, who recently rejoined the company, after having acted as chief engineer for the Watson Wagon Works for two years.

#### WAYNE WHEEL BANKRUPT

BUFFALO, Dec. 29—A voluntary petition in bankruptcy has been filed in Federal Court here by the Wayne Wheel Co. of Newark, N. Y. Liabilities are placed at \$122,960 and assets at \$182,424. The company is one of the oldest manufacturers of wood wheels.

#### SPECIAL FORD DIVIDEND

DETROIT, Dec. 29—The Ford Motor Co. has declared a special dividend of 3 per cent, payable Dec. 31, to employee investment certificate holders, making a total of 12 per cent for this year.

## Lincoln Tax Claim Cut to \$500,000

### Government Makes \$4,000,000 Reduction—Receiver May Ap- peal from Compromise

DETROIT, Dec. 29—The Detroit Trust Co., receiver for the Lincoln Motor Co., has received word from Washington that the Government's claim for additional taxes will be reduced to about \$500,000 from the \$4,505,681.23 figure first filed. The exact amount of the additional tax is being calculated and will be known in two or three days, according to President Ralph Stone of the trust company. Awaits Definite Figure

News of the Government's reduction was received too late to be available at the meeting of creditors held earlier in the day. President Stone said the receiver was not in a position to determine what action will be taken now that the Government's decision is known, but that immediate consideration will be given to the new situation. Stone expressed his appreciation of the prompt action of the treasury officials. All of these officials realized, he said, that practically nothing could be done in the way of reorganization until the amount of the Government's claim should be fixed and known. May Appeal

Pending the receipt of the actual figure on the tax allowance, the receiver and attorneys for the receiver, will consider whether to accept the Government's compromise on the additional tax, or whether to take a new appeal designed to bring the figure considerably lower. Notice of the Government's action and the receiver's contemplated course has been sent to creditors and to Donald D. Davis, secretary of the stockholders' protective committee at the New York Trust Co., N. Y. This favorable action is expected to expedite greatly the plans of the parties at interest in bringing about a reorganization.

#### Creditors Hold Meeting

At the meeting of the creditors with the receivers to-day a committee was organized to consider future action. C. W. Dickerson of the Timken-Detroit Axle Co. was named chairman of the meeting and John Watson, Jr., Cleveland, secretary. Other members of the committee are W. P. King, president of the Aluminum Manufacturers, Inc., Cleveland, who is its chairman; George D. McCann of the Dayton Engineering Laboratories, O. W. Myers of the Good-year Tire & Rubber Co. and M. S. Toulson of the Anderson Electric Co.

A sub-committee of the creditors' committee was named to meet representatives of the stockholders and other parties interested to consider plans for the rehabilitation of the company. Although manufacturing plans several months in advance have been laid out by the receiver, it is hoped to effect an early reorganization.



## Overland Contracts Call for 70,000 Cars

**Wilson Says Company Looks Forward to 1922 as Notable Year**

TOLEDO, Dec. 24 — Vice-president Charles B. Wilson of the Willys-Overland Co. told members of the Toledo Chamber of Commerce here in franker terms than any Overland official ever used what the actual status of the company is and how it has come through the business of the last year or more.

The Overland is now working about 6000 men, will close a few days for inventory and is expecting to have 8000 men at work by Jan. 15.

In the course of his remarks, Wilson said:

We are looking forward in 1922 to one of our steadiest and most prosperous years. This statement is not based upon idle talk but upon contracts signed with dealers which call for delivery of 70,000 cars in 1922.

We are in shape to start Jan. 1 to build up our working organization so as to get into maximum production as soon as possible and will try to reach the peak production not later than March 1.

The machinery is in order, the department heads are working together and we believe we have nearly 100 per cent co-operation in the whole working force.

### Notes Payable \$18,250,000

In answering the question "What does the Overland plant mean to Toledo?" Wilson said that it had meant in 1920 the purchase of \$17,391,000 in materials from local business firms, and the payment of \$20,573,000 in wages to employees.

He declared there was investment in plant and machinery here of \$40,000,000 and in branches of \$7,000,000 and proceeded to give a view of what had happened to the affairs of the company within the last year and a half.

In March, 1920, the Willys-Overland Co. had notes payable of \$34,400,000 and to-day the notes payable have been reduced to \$18,250,000. On May 31, 1920, accounts payable amounted to \$13,500,000 and to-day they stand at \$2,150,000.

The inventory in the spring of 1920 stood at \$46,100,000 of which experts determined that less than \$5,000,000 worth was in obsolete or surplus materials. To-day the inventory is \$19,000,000 and the surplus and obsolete material is being consumed at a rate which will see its end by April, 1922.

### Commitments Reduced

In July, 1920, the company had material purchase commitments of \$63,000,000. They have been reduced to \$7,000,000 to-day without any lawsuits and with maintenance of goodwill of most of the vendors.

Stocks of cars on hand indicate that the factory will have to get busy in the early months of the new year. Branches had 8476 cars on hand Jan. 1, this year, and now they have 5467 cars. The 4000

dealers had on hand Jan. 1 13,807 cars and to-day they have only 8298 cars. These are all included in inventory figures for the company.

The company has recently revamped its sales organization so that it now directly controls more than 80 per cent of dealers.

"During the first nine months of 1922 we will attempt to run as near an even production schedule as possible," Wilson declared. "The hardest drain on our cash will come in the first three months, according to our estimates. But we will be amply able to take care of our business without outside or unfair financial help."

Wilson said the Overland car was a better product, a proven product, reflected a better working organization and closer inspection and more careful purchase of materials than ever before in its history. He said the company had reduced wages, enforced economies and were enabled to make profit despite the cuts in price on the cars.

"The automobile business is back to normal and is as stable as wool, steel, and other industries," Wilson said.

It has been reported that nearly 800 new dealers have been added in the last month.

## Some Recovery Made in Wisconsin Industry

MILWAUKEE, Dec. 27 — An official statement by the Industrial Commission of Wisconsin says that employment in this State decreased 5 per cent during November. The iron, steel and machinery automotive and motorcycle groups were largely responsible for the reduction. However, it has been apparent in December that some recovery was made, for business has begun to show signs of revival in machinery, machine tools and foundries.

Based on an analysis of reports from 211 establishments with 58,100 employees, or almost one-third of all factory workers in Wisconsin now employed, and a weekly payroll of \$1,245,000, the Industrial Commission gives these figures: Automotive and motorcycle shops: Number employed in November, 3.4 less than in October and 52.9 less than in July, 1920; total wages in November, 12.1 less than in October and 78.4 less than in July, 1920; average weekly earnings in November, \$15.58; in October, \$17.13; in July, 1920, \$32.66.

## Urges Congress to Supply Yearly Fund for Roads

NEW YORK, Dec. 23 — The Highways Committee of the National Automobile Chamber of Commerce has adopted a resolution urging Congress to appropriate immediately \$100,000 annually for highway improvement for a term of five years under the present law. It is believed that this action would result in greater efficiency of expenditure by State highway departments in helping them lay out their programs.

## Makers Outlining Schedules for 1922

**Dodge Anticipates 600 Daily Production—Earl Expects 2000 in January**

DETROIT, Dec. 27 — Holiday week with many of the plants down for inventory finds the industry at its lowest production mark since 1920 but preparing to start off with a very decisive spurt immediately after Jan. 1. Many plants have been working during December preparing a stock of complete units in anticipation of a heavy early spring demand.

There has been no stocking of complete cars by dealers this year in anything like the usual proportion and this is expected to mean a heavy production pull at the factories. Dodge, assembling about 150 cars a day, has been building units for 450 cars and storing the surplus in anticipation of a 600 daily production schedule in January.

Earl Motors is rushing equipment for the new models to build upward of 2000 in January.

Ford Motors will resume its heavy production Jan. 3. Men have been ordered to report back on that day and at the offices orders are declared to be consistent with the usual seasonal demand.

### General Motors Program Completed

General Motors units have about outlined the schedules they will proceed upon for the early months.

Factories bringing out new show models are rushing work in preparation for orders on the new vehicles. This list will include probably a majority of companies in the industry, making it a very busy season in the Detroit district but a business of preparation rather than fulfillment.

Enclosed cars at prices not far above open models promise to be the feature of the national shows this year. Detroit will be represented by several manufacturers breaking into this class, the first being Essex Motors. The new enclosed car has a soft padded top with glass the principal constituent of the side structure. A strong bid for enclosed car business, particularly from persons in professional life, will be made with the new models and their appearance promises to create somewhat of a sensation.

## Approve Plan to Change Present Used Car Methods

BUFFALO, Dec. 27 — Resolutions to abolish present methods of dealing with used motor cars, and to establish a national company for their disposal, were approved at a meeting of the local association of automobile dealers at the Lafayette Hotel last night. Copies will be sent to the manufacturers by the dealers in charge of sales in the Buffalo territory and to the National Automobile Chamber of Commerce.

## Government to Have Association Policy

### Hoover Says Few Trade Bodies Come Within Supreme Court's Ruling

WASHINGTON, Dec. 24—With the decision of the Supreme Court in the hardwood case considered to be so sweeping that it prohibits numerous activities of trade associations, and does not confine itself merely to exchange of price information, as some believe, business interests of the country are anxiously awaiting the announcement of a definite policy by the Department of Justice on this question. Indications are that the Government will promulgate such a program within the near future. But even this, it is stated, may not be sufficiently assuring to some organizations which insist that their only safe refuge lies in the enactment of legislation which will clearly define their legal status.

#### Automotive Bodies Not Affected

No attempt has been made by Secretary Hoover to interpret the decision, inasmuch as this does not come within his province, but he does not consider the opinion to be so sweeping as do some attorneys who have closely followed the case, and thinks that it will not interfere with co-operation between his department and trade associations. He said that a survey conducted by the department showed that of the 1700 or 1800 trade associations of the country, less than 10 per cent were shown to be engaged in "trade recruiting" in violation of the law. So far as known, all the national associations connected with the automotive industry have a clear bill of health.

His view is not shared by those attorneys who consider that the decision has such a range that it destroys the very principles of trade associations as to the handling of trade information, other than that relating to prices. There is no doubt on the latter point, in the opinion of legal authorities, that exchange of price information is held to be clearly in violation of the Sherman anti-trust law. But some of them go much further and maintain that the opinion handed down through Justice Clarke is much more restrictive.

#### Broad Scope of Opinion Seen

They point to the following portion of the decision:

To call the activities of the defendants, as they are proved in this record, an "Open Competition Plan" of action is plainly a misleading misnomer. Genuine competitors do not make daily, weekly and monthly reports of the minutest details of their business to their rivals, as the defendants did; they do not contract, as was done here, to submit their books to the discretionary audit and their stocks to the discretionary inspection of their rivals for the purpose of successfully competing with them; and they do not submit the details of their business

to the analysis of an expert, jointly employed, and obtain from him a "harmonized" estimate of the market as it is and as, in his specially and confidentially informed judgment, it promises to be.

This is not the conduct of competitors, but is so clearly that of men united in an agreement, expressed or implied, to act together and pursue a common purpose under a common guide that, if it did not stand confessed a combination to restrict production and increase prices in interstate commerce and as, therefore, a direct restraint upon that commerce as we have seen that it is, that conclusion must inevitably have been inferred from the facts which have been proved.

#### Daugherty Favors Associations

It is the opinion of some attorneys that the foregoing reaches far beyond the question of price, although leading up to it, and that it implies violation of the law in handling data such as those bearing upon stocks, production, etc., where the figures are used to restrain trade and fix prices.

Attorney General Daugherty himself, in commenting on the decision, said he was unqualifiedly in favor of trade organizations which confined their operations to improving their service to the public, but he stated they would not be permitted to fix prices or apportion territory among themselves, resulting as it does, he asserted, in restricting competition. Mr. Daugherty proceeded to state that trade associations generally are showing a commendable willingness to confine their activities to the line broadly suggested by the Department of Justice as in conformity with the law. The majority opinion says in making a distinction between the exchange of information among sellers only and between sellers and buyers.

#### Reports Reached Seller Only

In the presence of this record it is futile to argue that the purpose of the "plan" was simply to furnish those engaged in this industry, with widely scattered units, the equivalent of such information as is contained in the newspaper and government publications with respect to the market for commodities sold on boards of trade or stock exchanges.

One distinguishing and sufficient difference is that the published reports go to both the seller and buyer but these reports go to the seller only; and another is that there is no skilled interpreter of the published reports, such as we have in this case, to insistently recommend harmony of action to prove profitable in proportion as it is unitedly pursued.

## Sees in Ship Subsidy Aid for Automobiles

MILWAUKEE, Wis., Dec. 27—Albert D. Lasker, chairman of the United States Shipping Board, in an address which he stated had passed the blue pencil of President Harding, told 700 Milwaukee business men at a testimonial luncheon given in his honor at the Milwaukee Athletic Club, that one of the big business development examples which is a sound argument for a merchant ship subsidy, lies in the automobile and tire field.

## Keen Competition Sighted for 1922

### M. A. M. A. Members See Greater Emphasis Laid on Quality Products

NEW YORK, Dec. 24—A year of keen competition, with good business for the strong companies and greater emphasis than ever before on quality products and service to the ultimate consumer is the outlook for 1922 in the automotive industry, according to a survey of financial executives and general managers of the principal parts and equipment manufacturers.

Prediction concerning the 1922 automobile passenger car and truck production and the consequent unit and accessory business show a considerable divergence, according to the results of a symposium conducted by the Motor and Accessory Manufacturers Association among its members. Many companies report that indications in their own business point to a substantial upward trend during 1922.

#### 30 Per Cent Increase Expected

The figures generally give a range between 20 and 30 per cent as the expected increase, although some manufacturers look for a more profitable year without an increased volume. This attitude is based on the general reduction in overhead and increase in productive and distributing efficiency which characterized 1921 business.

Three large and representative unit manufacturers in Detroit, making respectively automobile bodies, radiators and springs, were the first to answer the association's questionnaire, and without exception they predicted a marked improvement in 1922. The body manufacturer stated flatly that he was figuring on an increase of about 33 1/3 per cent over 1921 sales.

One radiator manufacturer forecasts a reasonable increase in output for those companies well established and giving good value in their product, and predicts that "truck companies should do a considerably greater volume." A spring maker feels that business will be slightly better than 1921 "with credit conditions crystallizing."

#### Sounds Note of Prudence

A note of prudence and conservative judgment is sounded by one of the leading piston-ring manufacturers in America, a company close in touch with many of the "key" automobile companies. He says:

The outlook for next year in the automotive industry, while brighter, does not by any means indicate a return to the unusual sales and marketing conditions which prevailed during the war, which, incidentally, must be recognized by all as abnormal, and a return to normal conditions does not by any means mean a return of the conditions prevailing during or just following the recent war.

(Continued on next page)



## Price Cuts Needed for British Trade

Cost of Bodies, Dealers Assent,  
Is Factor Retarding Car  
Reduction

LONDON, Dec. 20 (By Mail)—Information of a reliable nature in relation to production and price prospects must be awaited until the turn of the new year. Automotive factories, generally speaking, are practically closed. Very few firms with the notable exception of Morris Motors are working.

It is a general belief that prices must be lowered before sales can be expected to increase materially. Makers must accept their losses on material purchased before the slump. Daimler has again reduced the price of its "20" model but only by £50. The three categories of cars most desired in this market would be:

1. Not exceeding £350.
2. Not exceeding £700.
3. Not exceeding £1,500.

This estimate is based on a 25 per cent advance over pre-war prices to cover increased taxation and overhead expense. When these costs exceed that mark readjustment must be brought about by economies in management and production costs and by making wider use of specials for gear boxes, axles and engines. It is felt that British factories must come to this method of production.

Dealers generally are agreed that body prices are far too high and are the chief obstacle to bringing car prices down. They range from 200 per cent to 300 per cent above pre-war level notwithstanding the fact that all information points to just as much of a fall in the costs in this branch as in the chassis trade. A cut of £75 would have been the best trade stimulus for the recent show, but instead body builders have evolved another type which they call the "all weather" body and the prices remain where they were.

In connection with bodies it can be stated that Ford is having a slump in the sale of completed cars. Dealers buy the chassis and put other makers' bodies on them. The price averages about £140 for an interior drive, four to seven seater with rattle proof drop glasses and good upholstery.

## Keen Competition Sighted for 1922

(Continued from preceding page)

A representative sheet metal and stamping company in the Detroit district finds distinct promise of a good market in the new year, because of the low stocks now in manufacturers' hands, and changing models which will require a brand new set of parts.

Particularly significant is the following analysis, for it comes from a Michigan company, one of the largest wheel manufacturers in the country:

## NOVEMBER TRADE OF M. A. M. A. MEMBERS EXCEEDS IN VOLUME EARLIER EXPECTATIONS

NEW YORK, Dec. 27—Sales by members of the Motor and Accessory Manufacturers Association for November were only approximately \$3,000,000 less than for October and about \$4,150,000 less than for September. This volume of business was considerably larger than was expected at the beginning of the month. Present indications are that sales for December will equal those for November and may exceed them. November marked the ninth consecutive month with comparatively little variation in the volume of sales.

November brought a slight decrease in the total of past due accounts but a small increase in the total of notes outstanding. It was the first month since August to show a decrease in the total of past due accounts. The total of notes outstanding at the end of November was virtually the same as at the end of September. The figures for each month this year follow:—

Month	Total Purchases	Per Cent Change	Total Past Due	Per Cent Change	Total Notes Outstanding	Per Cent Change
January	\$6,264,587	.....	\$8,099,727	.....	\$4,359,871	.....
February	10,408,962	66.15 Inc.	6,717,165	17.07 Dec.	6,063,118	39.08 Inc.
March	20,120,386	93.30 Inc.	5,603,992	16.57 Dec.	5,069,877	16.38 Dec.
April	26,746,580	32.93 Inc.	5,352,271	4.49 Dec.	5,371,086	5.94 Inc.
May	26,781,350	.13 Inc.	4,505,176	15.64 Dec.	4,460,355	16.77 Dec.
June	22,703,414	15.19 Dec.	4,720,973	4.79 Inc.	4,012,670	10.37 Dec.
July	23,096,214	1.68 Inc.	5,242,046	10.79 Inc.	3,690,154	7.90 Dec.
August	23,397,640	1.31 Inc.	4,348,790	17.06 Dec.	3,494,510	5.30 Dec.
September	23,141,891	1.09 Inc.	4,358,545	00.22 Inc.	3,677,500	5.24 Inc.
October	22,053,327	4.70 Dec.	4,512,680	3.54 Inc.	3,463,500	5.82 Dec.
November	18,998,490	13.85 Dec.	4,352,000	3.56 Dec.	3,661,900	5.73 Inc.

The outlook for 1922 is even better than the outlook was two years ago today for the year 1920. Our business has averaged 70 per cent, each month of this year as compared with 1920, and we have every reason to believe that 1922 will be considerably better than 1921 or 1920.

One automobile engine manufacturer predicts that the year will be 30 per cent better than 1921, while another feels that there will be "a gradual but slight improvement in general business conditions so that by July, 1922, we may hope for what may be a 50 per cent of normal production." We doubt very much whether the production as a whole at the time mentioned will exceed the percentage stated.

A Cleveland manufacturer of various automobile units makes this statement:

The outlook for 1922 is almost as vague as it was for 1921, at this time a year ago. There is, however, a healthier and more optimistic feeling abroad. We have learned to know who are the strong companies in the industry and who are the weak ones. Some of those we thought weak have proved to be exceptionally strong, and vice versa.

The outlook for strong companies for 1922 is good.

The public is not saturated with automobiles; it is merely saturated with second choice and third choice weak automobiles but the demand for strong ones is good.

We do not think, however, that 1922 is going to show much more automobile business than 1921, and we are trimming our sails accordingly. Our reasons for this are many: chiefly, that there has been no increase in business that would place new money in the hands of the wage earners or that would place dividend money in the hands of investors, and until this is done, there will be no buying to speak of, of automobiles.

We believe 1922 will not be worse than 1921. We believe it will be somewhat better and gradually become more so.

## Columbia Motors Presents Bright View of Conditions

DETROIT, Dec. 27—An encouraging picture of the condition of the Columbia Motors Co. is presented in a letter sent to the president of the Detroit Stock Exchange by A. P. O'Connor, secretary and treasurer of the Columbia company. He states that more than 350 cars were shipped in August and more than 300 in September. Thirty new dealer connections have been made in the past two months and trade on the Pacific Coast has improved materially. Dealers in the southeast section have started ordering cars, stating that business is beginning to improve.

In reference to finances, the letter says:

Directors of this company feel confident that we have ample capital to carry us through any reasonable depression that may re-occur during the winter. We have reduced our loans at the banks during the summer approximately \$200,000, and at the present time, or, in fact, ever since we have been purchasing material on the new schedule, we have discounted all of our bills for material.

Our bankers assure us that they have no difficulty in re-discounting our paper at the Federal Reserve Bank, and that our statement makes all of our paper eligible for re-discount for some time to come.

## ASK TRUST FUND ACCOUNTING

FORT WAYNE, IND., Dec. 24 — Stockholders of the Huntington Automotive Co., organized to manufacture articles on which J. Archie Borland has patents, have adopted a resolution to seek an accounting for a trust fund gathered from stockholders of the defunct Rapid Rim Co. of Huntington, Ind.

## British Tire Makers Defend Quotations

Stearns, Oldsmobile and G. M.  
Truck Make Reductions  
from Present Prices

(Continued from page 1287)

Egyptian canvas which averaged 22d. per square yard before the war, costs new 52d. Wages are up by 150 to 200 per cent and manufacturing costs are approximately threefold higher.

Cotton, he adds, rose to 16 and 17 shillings per square yard during the war, and apparently this has been the most serious factor in bringing about the present unsatisfactory position of the tire industry.

## Stearns Lowers Prices; Cars Have Cord Tires

CLEVELAND, Dec. 28—The F. B. Stearns Co. has announced reductions on its models for 1922. The prices are as follows:

	Old Price	New Price
Roadster .....	\$2,450	\$2,250
5 passenger touring car	2,450	2,250
4 passenger Militaire..	2,475	2,275
7 passenger touring car	2,675	2,450
Coupe .....	3,400	3,150
Coupe Brougham.....	3,600	3,450
Sedan .....	3,700	3,450
Limousine .....	4,400	4,150
Town car .....	4,400	4,150
Landalet Brougham...	4,400	4,150

The company provided fabric tires for the prices quoted in 1921 while in the new year it will equip the cars with cord tires at the lower prices.

## SLIGHT REDUCTION IN OLDS

DETROIT, Dec 28—Slight price reductions effective Jan. 1 are announced on part of the Oldsmobile line by the Olds Motor Works. The changes are:

	Old Price	New Price
4 cylinder sedan.....	\$1,845	\$1,795
Small 8 coupe.....	2,185	2,145
Small 8 sedan.....	2,425	2,295
Small 8 touring car.....	1,625	1,595

No change of price has been made on the large eight line.

## G. M. TRUCK LOWER

PONTIAC, Dec. 28—General Motors Truck Co. has announced a reduction in the prices of its chassis effective Jan. 1 as follows:

	Old Price	New Price
Model K 41-2 ton.....	\$3,000	\$2,775
Model K 71-3½ ton....	4,250	3,950
Model K 101-5 ton.....	4,650	4,350

Model K 16, which completes the line, remains at its former price \$1,495, to which it was recently reduced.

Improved manufacturing facilities and readjusted inventory are stated to be contributing factors to the reduction.

## MAKE USED CAR SUGGESTIONS

NEW YORK, Dec. 28—A wide diversity of opinion on the best means to solve the used car problem is shown in the large

## COBB'S DINNER TALK TO BE ON GASOLINE

NEW YORK, Dec. 28—Irvin S. Cobb, who will be one of the speakers at the annual dinner of the National Automobile Chamber of Commerce on the evening of Jan. 10, has informed Alfred Reeves that his subject will be, "Gasoline, the New National Drink." The other speaker at the dinner will be Secretary of the Navy Denby, who has not yet announced his subject.

number of suggestions received from dealers by the National Automobile Chamber of Commerce in reply to the request for views on the subject.

It is held to be significant that many dealers declare they are opposed to an increase in discounts on the ground that they would be given away in trade. Many dealers endorse the slogan, "Buy Them Right." A further statement of the results of the survey will be made public as soon as an analysis of the suggestions received can be completed.

## Petition Filed in Willys Receivership Proceedings

TOLEDO, Dec. 28—Lloyd T. Williams of the firm of Brown, Geddes, Schmettau & Williams, attorneys here, filed an intervening petition in the Willys Corp. proceedings in Federal court here Tuesday on behalf of the United States Light & Heat Corp., Niagara Falls, N. Y. In the petition the battery company asks that the receivers be required to accept payment of \$802,153 in preferred stock of the United States Light & Heat Co. to cancel a note.

D. H. Kelly, vice-president, was here last week in conference with attorneys. Hearing has been set for Jan. 9.

John N. Willys is chairman of the board of the United States Light & Heat Corp. and C. O. Miniger, who is one of the receivers for the Willys Corp., is president and general manager.

## Bechtel Succeeds Bowser as Pump Company Head

FORT WAYNE, IND., Dec. 29—S. F. Bowser, founder and president of S. F. Bowser & Co., Inc., of this city, manufacturer of gasoline pumps and tanks, has retired from the presidency of the concern to become chairman of the board of directors and S. B. Bechtel, vice-president and general manager, has been named to the presidency.

## FLETCHER LEAVES EARL

DETROIT, Dec. 29—John Fletcher, vice-president of the Fort Dearborn National Bank, Chicago, has resigned as treasurer of Earl Motors, Inc., to devote all his attention to his banking duties. Leon S. Westcoat has been appointed his successor by Clarence A. Earl.

## G. W. Mixter Resigns From Pierce-Arrow

Will Be Succeeded as President  
of Company by M. E.  
Forbes

BUFFALO, Dec. 29—George W. Mixter, who became president of the Pierce-Arrow Motor Car Co. last May when G. W. Goethals & Co. retired from the management, has resigned. He will be succeeded as president by M. E. Forbes, who has been vice-president and treasurer of the company for some time.

Mixter took active charge of the Pierce-Arrow plant when the Goethals company was employed to assist in bringing the factory to a peace time basis and also to aid in revising its line of cars and trucks.

Colonel Charles Clifton, chairman of the board, in announcing the resignation of Mixter, said he consented last May to remain as president "until certain special work he had inaugurated was completed." This work has not been finished but the president asked to be relieved.

It would not be surprising if the retirement of Mixter might result in a return of some of the former executives of the Pierce-Arrow company. It has been persistently reported for several months that Henry May, who formerly was vice-president in charge of manufacturing, would return.

Colonel Clifton said the plant now is employing about 3200 men as compared with 1800 when the low point of production was reached several months ago. He added that operations in the last few months indicate that the company "has a product which can be manufactured with satisfactory results both to the public and to stockholders."

## Rutherford Will Head M. A. M. A. Committee

NEW YORK, Dec. 28—W. O. Rutherford, vice-president of the B. F. Goodrich Co., has accepted the chairmanship of the foreign trade committee which directors of the Motor and Accessory Manufacturers' Association decided at their last meeting to appoint. He is deeply interested in the export field.

Rutherford will appoint his own associates on the committee and it will work in cooperation with the automotive division of the Bureau of Foreign and Domestic Commerce in developing plans for the expansion of foreign sales by parts and accessory makers.

## FORD WILL NOT CUT

DETROIT, Dec. 28—The Ford Motor Co. in a telegram to dealers denies that prices of its cars will be cut around Jan. 1 as widely rumored. The company says: "As there is no foundation for these reports and we are not contemplating any price changes, we have no hesitancy in making a denial of this report."



# G. M. Starts Year with Clean Slate

## Losses Written Off; Has No Commitments

### Inventory Position Vastly Better Than Year Ago—Market Value May Exceed Book

NEW YORK, Dec. 28—Virtually all the units of the General Motors Corp. will start the new year with their books practically clear of commitments. Large sums have been spent in the past year in the cancellation of contracts on a basis entirely satisfactory to the persons supplying material and the equitable policy adopted by the corporation in this respect has made it many friends.

The inventory position of the corporation is vastly better than at the beginning of the year, as the result of heroic treatment. The new regime has written off its losses and all of them are behind it. It may be found when the inventories are completed that their market value is greater than the present book value, but if this is not the case they will be written down to meet the market so that 1922 can be started with a clean slate.

This policy of General Motors will permit it to turn out its products on the basis of present market costs for materials. It has made possible the sharp reduction in Cadillac prices and a further scaling down of the Buick and Oldsmobile sales prices. The corporation believes the prices of materials are as low as they will go for some time to come and that as a consequence no further price concessions in these lines are in prospect.

General Motors is determined, however, to sell its products at a price which will allow only a reasonable margin of profit. With this purpose in view it is constantly scanning its costs so that purchasers can be given the best values possible. This policy holds good in the export as well as the domestic field. There is no talk within the organization of a possible increase of prices in the coming year.

So far as production for 1922 is concerned, the corporation makes no predictions, but it can be stated that it expects to sell more cars than it did in 1921. It is believed that at the present prices the Cadillac and Buick factories will be kept running at capacity. Chevrolet is expected to continue on the satisfactory basis which has prevailed for months and the output of Oaklands has been steadily increasing of late. The past

## LOS ANGELES GETS LARGEST DELIVERY

NEW YORK, Dec. 28—What is said to be the largest single delivery of automobiles ever made to a retail dealer will be sent this week to Earl C. Anthony, Inc., of Los Angeles, by the Durant Motor Car Co. of New York. The shipment will consist of 500 Durant fours carried in a single train of 100 steel freight cars. The freight charges will amount to \$66,000 and the Durant company has received a draft for \$335,550 from Anthony to cover the transaction. Production at the Long Island City plant of the Durant company is now 75 cars a day.

year has brought many minor improvements in the Chevrolet and Oakland.

Tentative schedules call for a considerably larger output than in 1921. They are based partly on the belief that domestic sales will be somewhat larger and partly on the expectation, which amounts almost to a certainty, that the export business will be substantially larger.

Taking all factors into consideration, General Motors will start the year in a highly enviable position. Really remarkable progress has been made in 1921 in getting the big corporation back to normal and working on a co-operative basis which has strengthened each individual unit.

## Marsh Will Make Chief Address at S. A. E. Dinner

NEW YORK, Dec. 29—Arthur Richmond Marsh, president and editor of the *Economic World*, a former president of the Cotton Exchange and prominent in cotton activities, will be the principal speaker at the annual dinner of the Society of Automotive Engineers to be held at the Hotel Astor on Thursday evening, Jan. 12. His talk will be along economic lines and will deal particularly with the automotive industry.

C. F. Kettering, past president of the society, will serve as toastmaster. Addresses will be made by David Beecroft, retiring president, and B. B. Bachman, president-elect.

Reservations are now being made.

## TEST AIRCRAFT DEVICES

LONDON, Dec. 20 (*By Mail*)—Tests of the devices entered in the competition of the British Air Ministry for safety-fuel tanks for aircraft have commenced at the Royal aircraft establishment, Farnborough.

## Dort to Build Low Priced Closed Cars

### Sedan Will Sell for \$1195, Compared with \$985 for Touring Car

DETROIT, Dec. 28—Dort has added two lower priced enclosed models to its present line, a coupe, selling for \$1165 and a sedan selling for \$1195, as against \$985 for the touring car and roadster. The new models are upholstered in leather and equipped with heater, visor, etc. The older coupe, selling at \$1495 and the sedan at \$1545, both upholstered in brown cloth, are continued.

The refinements in chassis construction include lighter rods and pistons, use of multiple disc clutch in place of the cone type, use of slightly wider face gears in the transmission, adoption of spiral bevel gears in final drive, use of split spring seats with shims between halves, and increased stiffness in fenders, running board aprons, splash pan and some other pressed metal parts. A Connecticut ignition coil, and Alemite chassis lubricating system are now employed.

## Compiles Motorization Facts for Chicago's Use

INDIANAPOLIS, Dec. 27—Figures compiled for the information of Chicago officials show that the garbage collection department of Indianapolis has been able to save \$2.14 a ton by the use of motor equipment.

Before the motorization of the department here the cost of collection ran to \$5.76 a ton for the first five months of 1921. Late in the summer the new motor equipment was bought. In the six months from June to the end of November the department, which had been transferred to the control of the sanitary board, by the use of motor equipment brought the cost down to \$3.62 per ton.

## COLLINS PRODUCTION POSTPONED

DETROIT, Dec. 29—R. H. Collins has postponed indefinitely, it is learned, the bringing out of the Collins automobile and will exhibit at the shows this year only the Peerless line with minor refinements and no change of price. After Collins left the General Motors organization he incorporated a company in Michigan to manufacture a high grade car and so far as can be learned he has not abandoned his plan of building one eventually.

## Aircraft Commerce Chamber Formed

Will Take Over Some Duties Formerly Assumed by Manufacturers Association

NEW YORK, Dec. 28—The aircraft industry has formed a national organization under the name of the Aeronautical Chamber of Commerce and has taken over the offices and equipment of the Manufacturers Aircraft Association at 501 Fifth Avenue, this city, which it partly succeeds.

The latter organization will continue to serve its members in handling the administration of the cross license agreement covering airplane patents but the Chamber will assume and greatly extend all of the functions formerly handled by the older organization, including the collection and the dissemination of information regarding aeronautical activities in this and other countries, the publication of the Aircraft Year Book and the furnishing of special services to its members through its various departments and committees.

### Has 100 Charter Members

The new organization, which has been chartered under the laws of the state of New York with approximately 100 members represents virtually every section of the country in the field of designing, construction, operation and kindred activities. Among other things it will endeavor to do will be the development of the market and the increase of the use of flying machines among civilians, corporations and transportation companies.

Its aims and purposes are set forth in the charter as follows:

To foster, advance, promulgate and promote trade and commerce, throughout the United States, its territories, possessions, and in foreign countries, in the interests of those persons, firms or corporations engaged in the business of manufacturing, buying, selling and dealing in aircraft, aircraft motors, and aircraft parts and accessories of every kind and nature.

To diffuse among its members accurate and reliable information as to the standing of its members and those persons, firms or corporations engaged in similar lines of business.

To procure uniformity and certainty in the customs and usages of trade and commerce among its members and those persons, firms or corporations having a common trade, business or professional interest in all matters pertaining to aeronautics.

To aid and assist in mapping out air roads and lanes; the location of landing fields, air-dromes, hangars, or such other structures as may be necessary for the advancement of aeronautics.

To advocate and promote in every lawful way the enactment of just and equitable laws . . . pertaining to aeronautics.

To settle, adjust and arbitrate any and all differences which may arise between its members, and persons, firms or corporations dealing with them.

To promote a more enlarged and friendly intercourse between its members and persons, firms and corporations engaged in the

business of, or dealing in aircraft, aircraft motors and aircraft parts and accessories, and generally to do every act and thing which may be necessary and proper for the advancement of the aeronautical art and industry and the accomplishment of the objects and purposes hereinbefore set forth; provided, however, that nothing herein contained shall authorize this corporation to engage in any business for pecuniary profit.

## Detroit Company May Buy Plant of Maibohm Motors

TOLEDO, Dec. 28—The public sale of Maibohm Motors Co. plant at Sandusky has been postponed indefinitely but negotiations for a private sale are expected to be consummated this week. Approval of the court will be asked for such a plan.

The general reorganization plan will be adhered to, it is asserted, except that a Detroit concern now operating there will bring in new money and organization and continue the Maibohm production along with their other manufacturing at Sandusky. The Detroit company desires to take advantage of economies of manufacture offered by the smaller city.

Chairman E. G. Kirby of the creditors committee said the new plan was looked upon very favorably. Creditors would be given preferred stock in the Detroit company to the amount of their claims. He said most creditors would prefer to have a new management take over operations. Details are being rushed so that announcement may be made at the New York show.

## Expect Export Call for Farm Machinery

ATLANTA, GA., Dec. 24—A general rejuvenation of agricultural activities in all European countries with the use of modern power machinery, and materially better business for the power farming industry in this country during the next two years, is anticipated by American manufacturers of tractors and power farming machinery, according to statements by executive officials of the International Harvester Co., at a southern conference in Chattanooga.

The International, which has large plants in Chattanooga, has reopened three of its large European plants the past year, officials stated, and anticipates capacity production within the next twelve months. The industry has suffered considerable in this country during the long period of agricultural and business depression, but much better times are in prospect for 1922, dealers attending the conference were told.

### BARS ROADS TO TESTS

DETROIT, Dec. 28—A decision by the State Supreme Court withholds the use of State highways for testing motor vehicles, the specific case being a suit by Gratiot County against the Republic Motor Truck Co., Alma. The court held that trucks undergoing tests were not engaged in legitimate traffic and therefore the expense of repairing damage should not be borne by taxpayers.

## Test Road Holds Up Under Heavy Traffic

Impact Not as Serious in Highway Destruction as Generally Believed

SAN FRANCISCO, Dec. 27—Traffic alone is not to blame for concrete road failures, according to a report of A. G. Gowans, highway engineer representing the California State Automobile Association, who has been watching results at the circular highway which is being tested to destruction at Pittsburgh, near this city. From Nov. 9 to Dec. 17 a fleet of forty trucks have driven 2,257,450 tons over the highway and on the latter date the road, taken as a whole, does not show any evidence of this enormous traffic.

A number of cracks have appeared but more than half developed before any traffic was put on the pavement. The traffic itself did not seem able to enlarge the cracks with any speed. The evidence of traffic wearing away concrete surfacing, according to Gowans, has also been lacking. "In fact," he says, "on the straight sections of the road no appreciable evidence of wear can be seen."

### Pneumatics Make Little Difference

Gowans further states:

In the opinion of the various engineers who have observed the traffic over the road it is impossible to draw any comparison of it with any thoroughfare in this country. In other words there does not exist any highway to date that begins to carry the traffic that has been put over the Pittsburgh test road. This has therefore shown more than ever that traffic alone is not to blame for concrete road failures.

A few points have now become evident, such as the fact that in a majority of observations a moving load does not produce as great a deflection in the concrete slab as one standing still. Impact has been studied sufficiently to show already that it takes a high rate of speed and a fall of at least one inch to produce deflections in a slab that are at all serious. This must also be done by a vehicle using hard tires that reach any good speed, and the larger the truck the slower its speed. Furthermore, a highway as built to-day and maintained does not offer much in the way of a real rough surface. Impact, therefore, does not appear to be quite as serious a factor as has formerly been the idea.

It is also interesting to know that the experiments made with vehicles using pneumatic tires prove that the impact with air tires produces little if any different deflection than produced by the vehicle merely moving straight along.

### PROTESTS POWER RATES

DETROIT, Dec. 28—General Motors Corp. has filed an application with the Michigan Public Utilities Commission asking for a reduction in the power rates of the Consumers Power Co. A hearing has been set for Jan. 18. General Motors holds that rates filed under the Miller law of 1921 are much higher than formerly.



## G. M. Zones World for Export Trade

### Changes from Plan of Grouping Its Various Products into Divisions

NEW YORK, Dec. 28—Reorganization of the General Motors Export Co., which handles the foreign sales of all G. M. C. cars and trucks, has rapidly followed the appointment of J. D. Mooney, formally of the Remy electric division, as vice-president in charge of operation of the export company. Changes in the personnel already have been made, the most important of which returns Peter Steenstrup, former export chief, to the domestic corporation and names D. A. Laing as sales manager of the export organization. Laing has been in the export organization for several years and has already taken over his new duties.

The export company has given up a former plan of grouping the various products into divisions, with a chief in charge of each, such as Buick, Cadillac, etc. The present plan and the one that Mooney is putting into effect zones the world in various territorial divisions, such as the Pan-American, European, Oriental, Australasian, etc. Each zone will have a chief who will be responsible, with his field men, for the merchandising of all General Motors products in his territory. This system, it is believed, offers better opportunities for intensive merchandising effort.

#### Expects Bigger Year

Another important change elevates S. W. Dorman to the position of vice-president and general manager of the Overseas Motor Service Corp., which handles the export sales of accessories and equipment. Dorman has been nominally in charge of the Overseas company for some time but his position is greatly strengthened by the change.

The export company is preparing for the new year with the expectation that it will be materially larger than 1921. New inquiries and orders contingent upon the price reductions just announced indicate that its position will be much stronger. Working more closely with its foreign distributors, the company expects to gain more intensive sales of its products.

### Tire Companies Start Year in Better Position

AKRON, Dec. 28—The tire companies here will start 1922 in a much stronger position than they were 12 months ago and all of them are looking forward to increased production early in the year. Inventories have been worked down and commitments still held by fabric and rubber producers have been adjusted on a satisfactory basis.

A year ago the Goodyear Tire & Rubber Co. was in the midst of financial difficulties which resulted in a reorganization

but it now has been brought to a strong financial position.

The Firestone Tire & Rubber Co. has taken all its losses as shown by the last balance sheet when assets were reduced from \$107,000,000 to \$75,000,000.

It is reported that the entire indebtedness of the Miller Rubber Co. has been wiped out and the floating indebtedness of the General Rubber Co. has been liquidated.

## FINANCIAL NOTES

Bates Machine & Tractor Co., through Straus Brothers Co., is offering at 100 and interest \$300,000 8 per cent notes due April 1, 1923 to 1927, for the purpose of funding the floating debt and augmenting the working capital.

Miami Cycle & Manufacturing Co., Middletown, Ohio, has increased its capitalization from \$1,371,900 to \$2,500,000, and an outstanding issue of preferred shares amounting to \$2,064,500 has been replaced by an issue of \$1,371,900.

Spicer Mfg. Corp. has declared the regular quarterly dividend of 2 per cent on its preferred stock, payable Jan. 1, 1922, to stock of record Dec. 20, 1921.

Reo Motor Car Co. directors were all re-elected for another year at the annual stockholders' meeting.

F. B. Stearns Co. declared the regular quarterly dividend of \$1, payable to stock of record Dec. 31.

### Offer Awards for Designs at Body Builders Exhibit

NEW YORK, Dec. 27—In addition to the display of passenger car bodies which will be seen at the Body Builders' Exposition which will be held in the 12th Regiment Armory Jan. 9 to 14, there will be a full line for commercial vehicles including dumping bodies, light and heavy panel bodies and omnibus bodies. The management of the show has appropriated \$500 for cash prizes for the best body design. It is stated that more than 40 of the leading designers already have entered the contest.

The contest is open only to individuals. The design must illustrate a complete car with a body which will accommodate four or more passengers. The awards will be based on the merit of the design itself, its fitness for the chassis and its practicability. The body must fit some one of the chassis used in substantial quantities by any automobile manufacturer. The chairman of the committee on awards is William Brewster.

#### DURANT STARTS AT LANSING

DETROIT, Dec. 28—Durant Motors of Michigan has started production at Lansing, although no set schedule will be entered upon until after Jan. 3. Two hundred and fifty men are employed at the start, this number to be augmented steadily as production grows. Until the completion of the Oakland, Cal., plant all far western territory will be supplied from Lansing.

## BANK CREDITS

*Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.*

As the year draws to a close money rates have been showing a tendency toward firmness, but the markets have been dull and inactive. Call loans which opened last week at 6 per cent closed the week from 5 to 5½ per cent secured by both mixed and all industrial collateral. For the time loans 5 to 5¼ per cent for all periods from 60 days to 6 months' ruled last week as in the week previous. Choice name mercantile paper for all maturities likewise ruled at this rate, money loaning on less well known names at ¼ per cent above the rate for prime mercantile paper. There was but light demand for bankers' acceptances, most of the large institutions being out of the market for the time being. The American Acceptance Council posted rate for such acceptances advanced from 4½ to 5½ per cent.

The Federal Reserve System in its statement for December 21 reflected considerably larger borrowings by the member banks, bills discounted having increased during the week by \$71,870,000 to \$1,224,703,000. Bills bought in the open market likewise increased materially so that the total bills on hand December 21 of \$1,351,228,000, marked an increase of nearly \$100,000,000 in bill holdings. A feature of the week, however, was the entire disappearance of inter-bank rediscounting of bills, which has been for so long a time the resource of the weaker banks in the South and Southwest.

The holiday demand for currency increased the amount of Federal Reserve notes in actual circulation \$53,783,000 during the week, the total of such notes in circulation being \$2,447,560,000 on December 21, 1921, compared with \$3,404,931,000 of notes in circulation on December 23, 1920, which was the largest amount of such circulation on record.

Deposits of the Federal Reserve System on Dec. 21 of \$1,784,750,000 were \$41,990,000 larger than the week before, the increase being entirely due to a growth in the member bank reserve account, government and other deposits having fallen off. Although gold holdings were enlarged by \$1,821,000, the paying out by the banks of \$10,347,000 in silver and local tenders caused a decline in total reserves which were \$2,993,060,000 on Dec. 21.

#### PURDUE GIVES COURSES

LAFAYETTE, IND., Dec. 27—Starting Jan. 23, Feb. 6 and Feb. 20, three courses in the use of tractors, etc., will be given by Purdue University for the benefit of Indiana farmers or tractor men who are interested in the more efficient operation of gasoline tractors and engines. Those taking any of the three courses will also do a large amount of laboratory work. The lectures will be delivered in the shops or in rooms adjoining them so that all the tractors and parts may be easily demonstrated.

## MEN OF THE INDUSTRY

**L. D. Sasscer** and **W. C. Middleton** have joined the factory sales organization of the Peerless Motor Car Co. to assist in expanding the company's distributing organization. Sasscer has been assistant general manager of the Detroit branch of the Cadillac Motor Car Co. and previously had acted as a specification manager for Cadillac with the Chicago branch and the Philadelphia distributor. Middleton was also engaged in sales work with the Chicago branch of the Cadillac company and the Philadelphia distributor.

**Earl B. Stone**, who for two and a half years has been connected with the Cleveland Tractor Co., as sales representative, district sales manager, and assistant advertising manager, has succeeded **George B. Sharpe** as advertising manager. Sharpe who has been with the Cleveland company for several years, resigned to become associated with the Burroughs Adding Machine Co. Stone has had advertising experience for many years with the General Fire Proofing Co., and the National Acme Co. Sharpe began his association in the advertising field with the Studebaker company many years ago and has been one of the aggressive men in the tractor advertising field for several years.

**Frank K. Bull**, chairman of the board of directors of the J. I. Case Threshing Machine Co., Racine, has resigned, effective Dec. 31, and will retire from active affairs, although retaining extensive holdings in the corporation. Bull, eldest son of the late Stephen Bull, one of the founders of the Case company with the late Jerome I. Case, was born in Racine in 1858. At nineteen he entered the Case works as an apprentice in the repair department. In 1881 he was elected secretary and in 1897 he became president, retiring in 1916 to become chairman of the board. Since that time he has spent much of his time at the country estate at Camden, N. C., with his family.

**F. J. Leyerle** has been appointed service manager of the Franklin Automobile Co., Syracuse, succeeding **Paul Williams**. Leyerle has been acting as assistant to President **H. H. Franklin** since April 1. Before coming to the Franklin organization, Leyerle was associated with the G. W. Goethals Co., industrial engineers, and was assigned by them to the plant of the Splitdorf Electric Co. at Newark, where he acted as assistant factory manager in charge of factory administration.

**Glenn A. Tisdale**, president of the Franklin Motor Car Co. of New York, has been appointed commander of the automobile accessories division in the mobilization of New York business men in the "budget guard," which is being organized by the National Budget Committee. He already is at the head of the motor car dealers division. Tisdale contends that burdensome Federal taxation has seriously impeded motor car sales.

**R. S. Townsend**, general sales manager for the Chevrolet assembly plant in Texas and Oklahoma, with headquarters at Fort Worth, has been transferred to Tarrytown, N. Y., where he will be director of sales through the New England and Atlantic seaboard states. He will be succeeded by **L. S. Costly**, now his assistant, while **Costly's** assistant will be **George G. Beakley**, at present special territorial representative.

**Walter E. Flanders**, chairman of the board of directors of the Rickenbacker Motor Co., will distribute the new car in Maryland, Vir-

ginia and the District of Columbia under the name of Flanders-Rickenbacker Motor Co. Headquarters will be in Baltimore, with branches in Washington, Norfolk and Richmond. **A. J. Jarvis** of Detroit will be general manager. **George Flanders** will be associated with his father.

**J. J. Hunt**, long associated with the distribution of the Reo car in New York, has been given a franchise for the Metropolitan district by the Rickenbacker Motor Co. He will operate under the name of the Hunt Motor Car Co., Inc. Hunt took charge of Cadillac affairs in New York in 1905 and then joined Reo as eastern territory representative, later taking charge of the New York Reo branch.

**George W. Cushing**, advertising manager of the Hudson Motor Car Co. and Essex Motors, has resigned to become associated with the advertising agency of Barton, Durs-tine & Osborne, Inc., New York City. Cushing will work in the Buffalo office of the company. Before joining Hudson he was advertising director of Federal Motor Truck Co.

**W. H. Girdlestone**, formerly sales manager of the eastern district of Splitdorf Electrical Co., has joined forces with **H. B. Shontz Co., Inc.**, New York distributor of USL storage batteries, as sales manager in charge of battery and electrical service station equipment. Girdlestone has been connected with the automotive industry for nearly twenty years.

**J. J. Cole**, president of the Cole Motor Car Co., and his family have arrived at Cherbourg, France. While ostensibly the trip is taken for recreation, Cole will make a thorough study of economic conditions abroad and of motor car development in European countries. He will visit France and Egypt before returning home, some time in April.

**H. E. Keller**, long identified with the rubber industry as a sales executive, has been appointed director of sales of the Diamond Rubber Co., Inc., Akron. For more than nineteen years Keller was associated with the B. F. Goodrich Rubber Co. and previous to his present appointment served with the Diamond company as district manager.

**Ralph E. Brown**, Buffalo, has resigned as sales manager of the A. W. Halle Motor Co., distributor for western New York, to become president and general manager of the Packard Buffalo Motor Car Co. Before establishing Buffalo connections, in 1909, Brown was assistant manager of the retail division of the Winton Motor Car Co. at Cleveland.

**J. B. Bartholomew**, president of the Avery Co., has been elected an honorary member of the American Society of Mechanical Engineers in recognition of "outstanding service to agriculture particularly in the application of engineering agriculture" through his activities in the farm equipment industry.

**O. H. McCornack** has been elected vice-president of the Hudson Motor Car Co. McCornack, who has been general sales manager of the Hudson company for the last five years, will continue in charge of sales, advertising and service activities in connection with both Hudson and Essex cars.

**Charles H. Domville**, who joined the staff of the Commonwealth Motors Co., Chicago, several months ago in the capacity of district sales manager, has been appointed assistant sales manager. Domville was formerly associated with the Yellow Mfg. Co. as assistant sales manager.

**Peter S. Steenstrup**, vice-president and general manager of General Motors Export

Corp., has been transferred to General Motors Corp. as an assistant to **Albert P. Sloan, Jr.**, vice-president in charge of operations, to undertake special duties.

**Seiberling Rubber Co.'s** acquisition of the Lehigh and Portage rubber companies means the discontinuance of the Lehigh and Huskie tires. The plants will be used exclusively for the production of Seiberling and Portage tires and tubes.

**J. J. Ritter** has been appointed Michigan distributor of the Visible Pump Co. of Fort Wayne, Ind., of which he has been production engineer for the last year and a half. His headquarters will be in Detroit.

## Some Louisville Dealers Equalled Record of 1920

LOUISVILLE, KY., Dec. 27—A canvass of representative passenger car dealers in Louisville reveals the fact that in 1921 many firms did a volume of business equal to that of 1920. Profits were not so great because of the reduced list price on all makes of cars, but the number of sales held up remarkably well for those dealers who kept hard at work.

On one make, the local sales of new passenger cars increased 45 per cent in 1921 over 1920. There was a marked tendency in December toward rush business. This followed a rather quiet fall. December, with the added impetus given it by Christmas gift suggestions and advertising, tried by local dealers on a wide scale for the first time, offset the loss of quiet business in the preceding month.

## Former Chevrolet Head and Buick Founder Dies

FLINT, MICH., Dec. 27—**C. C. Begole**, formerly president of the Chevrolet Motor Co. of Michigan, died in St. Petersburg, Fla., Thursday, according to advices received here. Besides his association with the Chevrolet company, Begole was one of the founders of the Buick Motor Co., of which he was the first president, and was also one of the leaders of the Flint Wagon Works, the pioneer vehicle industry of Flint.

He was a son of **Josiah Begole**, who was formerly governor of Michigan and one of the founders of the Flint Wagon Works.

## BRITISH ENGINE LOSS

LONDON, Dec. 20 (*By Mail*)—The **W. H. Dorman Co., Inc.**, at Stafford, manufacturer of engines for cars, trucks and tractors, report a loss of £223,292, after crediting £196,582 taxes since recovered. For the trading year 1919-1920 the company showed a profit of £72,980 and carried forward £43,947. It paid 10 per cent dividend on common stock and 9 per cent on preferred.

## NEW ROAD FROM LIMA

LIMA, PERU, Dec. 4 (*By Mail*)—The construction of a concrete toll road between this city and Callao, its port on the Pacific Ocean, has been authorized in a concession recently granted. The new road will be 10,250 meters in length. Its width will be seven meters. The work must be started within six to eight months and completed within 18 months.



## INDUSTRIAL NOTES

Edmund S. Wolf, Bridgeport, Conn., has been appointed temporary receiver for the Coe-Stapley Mfg. Co., West Haven, Conn., maker of automobile and bicycle pumps and sheet metal products, upon application of creditors who filed a petition in bankruptcy against the company. The company was organized in 1918 and has a capitalization of \$950,000. R. E. Carpenter, Boston, is president and Robert R. Adams, Bridgeport, treasurer.

American Motors Service, Pittsburgh, Pa., has been formed by G. E. Burroughs, I. V. Conneely and associates for the purpose of leasing a chain of service stations and distributing parts and equipment direct from factory, private garage equipment and tools complete. Sales offices forming in Pittsburgh, Cleveland and Toledo will open May 1, 1922.

Edward G. Kirby has been appointed receiver for the Zenith Tire & Rubber Co., Cleveland by the Federal court at Toledo. Kirby is trust officer of the Commerce Guardian Bank, Toledo. His bond has been fixed at \$10,000.

Cutler-Hammer Mfg. Co., Milwaukee, has moved its Boston office from the Columbian Life Building to the Harvety Building, Chauncy Street. C. W. Yerger is manager of the Boston office.

Giant Tire & Rubber Co. has moved its operations to the plant formerly owned by the Grant Motor Car Corp. at Findlay, Ohio, and is adding \$300,000 new capital for the purpose of business expansion.

Republic Rubber Co. is reorganizing its sales department and re-establishing agencies preparatory to a nation-wide campaign. No move will be made toward reorganization until after Jan. 1, 1922.

Percival Wilds has been appointed receiver for the Manhattan Motors Corp., New York City, under \$5,000 bond. The liabilities are stated to be \$100,000 and the assets about \$25,000.

## Dallas Sold 30,000 New Cars During Year

DALLAS, TEX., Dec. 27—Dallas automobile dealers have sold 35,000 cars this year despite the fact that times have been called dull and money tight. Of that number 30,000 were new cars valued at more than \$30,000,000. Five thousand used cars were sold at \$2,500,000.

This is the estimate made by half a dozen dealers as the year was closing, and some of the dealers assert the sales might run a thousand cars more. Of the total number, 12,000 were sold by retailers in Dallas and the remainder by the wholesale houses here.

The last two weeks of the year are proving banner ones, according to retailers. This was due to the large number of cars sold as "Christmas" presents and general cleaning up of stocks for the first of the year.

## BETHLEHEM REFUSES OFFER

ALLENTOWN, PA., Dec. 23—Local creditors of the Bethlehem Motors Corp. have been informed by Clinton E. Woods,

the receiver, that an offer of \$400,000. had been made for the plant, but that creditors' committees had decided not to sell for less than \$750,000, although the plant has deteriorated rapidly since operations were discontinued. Claims than \$3,000,000 and creditors will not realize more than 20 cents on the dollar. against the company aggregate more

## Philippines Resist Prohibitive Taxation

LOS ANGELES, Dec. 27—Automobile dealers and motorists in Manila, Philippine Islands, have successfully resisted, at least for the present, the efforts made to impose a prohibitive tax on all cars in use in that city. The new motor vehicle tax that was recently placed in effect was the one largely sponsored by the dealers as reasonable.

The tax rates are as follows:

(a) passenger motor vehicles, Pesos .25 per horse power (Peso 50 cents U. S. money) and one centavo (1 centavo equals \$0.005) additional for each vehicle with pneumatic tires and two centavos for those with metal tires; (b) for trucks, passenger or freight or both, 40 pesos per ton capacity and one centavo additional for each additional kilo of capacity; (c) trailers, 10 pesos for those of less than two tons capacity and 20 pesos for two or more than two tons capacity; (d) motorcycles with no side cars, 3 to 5 pesos.

The ordinance will only be in effect until the Legislature of the Philippines, now in session, passes legislation to cover the entire islands.

## Transport Has New Line of Specialized Trucks

MT. PLEASANT, MICH., Dec. 27—The Transport Truck Co. will begin the year with a new line of specialized trucks at reduced prices based on present costs. The company will feature six models, or two more than it had previously. The line includes: Model 15, "Rapid Transport," 1-ton, equipped with pneumatic tires, at \$1,295; Model 25, 1½-ton, \$1,495; model 35, 2-ton, \$1,885; Model 55, 3-ton, \$2,385; Model 60, 3½-ton, \$2,585; Model 75, 5-ton, \$3,485.

The old prices on transport models have been: 1-ton, \$1,395; 1½-ton, \$1,995; 2½-ton, \$2,785; 3½-ton, \$3,885.

The models 35, 55, 60 and 75 are all equipped with drive shaft brake, 4 speed transmission and electric lights, bumper, hubodometer and Moto-Meter.

## Delaware to Enforce Law Covering Motor Lenses

WILMINGTON, DEL., Dec. 27—Following a motor lens test, held here under the direction of State officials, announcement was made by the Secretary of State's office that an official list of lenses permissible in this State, will be published about Feb. 1. It was said, also, that rigid enforcement of the law regarding lenses will be started at that time. The law was enacted three years ago, but has not been rigidly enforced.

## METAL MARKETS

NEVER productive of anything very startling in the way of market activity or developments, the last week of the year ran true to form. An auspicious omen, however, is the large amount of preliminary correspondence with reference to 1922 deliveries of automotive steels. Some automotive interests are sounding the market not only regarding first but also second quarter shipments, especially of sheets. The firmness of the sheet market which is laid special stress on in steel circles is undoubtedly due to the anticipation of a heavy automotive demand over the next few months.

The usual end-of-the-year report that the Ford Motor Co. had entered actively upon covering its first quarter 1922 sheet requirements was in circulation last week. Undoubtedly all automotive manufacturers have provided themselves with the steel tonnages necessary for their initial operating schedules of 1922, and the orders which are looked for to be placed in the next few weeks pertain to February and March shipments.

It will probably be the middle of January before a general resumption of activity in the steel industry takes place. From that time on steel producers look for a steady rise in the demand upon their output, the prevailing impression in the trade being that by April or May the industry will have re-established itself on a satisfactory basis of operations.

The explanation for this condition is that, because of its moderation in the matter of prices during the 1920 flurry, many consumers give corporation subsidiaries the preference at even prices while others will go so far as to pay them \$1 or \$2 a ton more than the lowest price quoted by "Independents." Conclusive evidence of this sort that a conservative price policy proves most remunerative in the long run is likely to have a salutary effect upon the market. The iron and steel industry awaits with much concern the result of hearings to be held Jan. 21-23, 1922, when the Interstate Commerce Commission will inquire into the equity of rates on ore, furnace materials and iron and steel articles.

**Pig Iron.**—Although the market generally rules quiet, pig iron sellers report better interest in foundry and malleable on the part of automotive foundries. The tone of the market continues easy.

**Steel.**—Some of the non-integrated sheet mills are reported to have been able to place contracts for 1922 deliveries of sheet bars at as low as \$28.50 a ton. A few weeks ago the market was considered to be between \$30 and \$32. It is claimed for the sheet market itself that not in a long time has it been as steady as it is now and that orders offered at below the prevailing quotations of 2.25c. for blue annealed and 3c. for black have been turned down. In spite of this, one encounters here and there rumors of slight price shading by small independents. Activity in strip steel and screw stock is apparently held in abeyance until after the New Year holiday.

**Aluminum.**—No change has come over the market and, while some tonnages of imported metal are reported to be the subject of negotiations between brokers and consumers, price levels have undergone no revision.

**Copper.**—The usual end-of-the-year calm prevails in the market for the red metal. Sentiment, however, is very cheerful. The trade looks upon the absorption of the American Brass Co. by the Anaconda Copper Mining Co. as an accomplished fact.

# Calendar

## SHOWS

- Jan. 7-13—New York, National Automobile Show, Grand Central Palace. Auspices of N.A.C.C.
- Jan. 9-14—New York, Motor Car Body Exposition, Automobile Body Builders Association, Twelfth Regiment Armory.
- Jan. 28-Feb. 4—Chicago, Automobile Salon, Hotel Drake.
- Jan. 28-Feb. 4—Chicago, National Automobile Show, Coliseum, Auspices of N.A.C.C.
- Feb. 6 to 11—Seventh National Tractor Show and Educational Exposition, Minnesota State Fair Grounds, Minneapolis.
- Feb. 6 to 11—Winnipeg, Can., Automotive Equipment

Show, Western Canadian Automotive Association.

## FOREIGN SHOWS

- March, 1922—Santiago, Chili, Annual Automobile Show.
- April 16—Mexico City, Annual Automobile Show, Auspices of the Automotive Division of the American Chamber of Commerce.
- April 22-May 1—Prague, Czechoslovakia, Fourteenth International Automobile Exhibit.
- May, 1922—Quito, Ecuador, Agricultural Exposition, celebrating Centenary of Ecuador. Automotive Section.
- Sept. 1922—Rio de Janeiro, Brazil, Automobile exhibits in connection with the Brazilian Centenary Association Automobilista Brasileira.

## CONVENTIONS

- Dec. 20—Philadelphia, American Society of Mechanical Engineers.
- Dec. 27-29—Chicago, American Society of Agricultural Engineers, Auditorium Hotel.
- Jan. 17-20, 1922—Chicago, American Road Builders Association.
- Jan. 30-31—Chicago, Fifth Annual Convention, N. A. D. A., La Salle Hotel.
- Jan. 30-Feb. 2—Boston, Sixth Annual Conference of the International Delivery Association, Copley Plaza Hotel.
- May 10-12—Philadelphia, Ninth National Foreign Trade Convention of the National Foreign Trade Council.

- June 11-15—Milwaukee, Annual International Convention of the Associated Advertising Clubs of the World.
- Sept. 18-23, 1922—Rome, Italy, Second Annual Meeting of the International Chamber of Commerce.

## S. A. E. MEETINGS

- Detroit, Feb. 24, Mar. 24, April 28, May 26.
- New York, Jan. 10-13, 1922—Annual Meeting.
- New York, Jan. 16, First Annual Meeting of Advisory Board on Highway Research, Engineering Societies Building.
- Chicago, Feb. 1
- Minneapolis, Feb. 8-9—Annual Tractor Meeting.

## November Exports Total \$5,000,000

Declined from October, But Reach Business Transacted in September

WASHINGTON, Dec. 27—Automotive exports in November, not including tires, totaled almost \$5,000,000, according to figures announced by the Bureau of Foreign and Domestic Commerce, thus reaching a total somewhat smaller than the foreign business done in October but practically on a par with that in September and larger than that of August and July. Total exports in November covering cars, trucks, parts, motorcycles and airplanes were \$4,921,887, according to the Bureau statement.

The total represented slight recessions from those recorded in October, which in their turn were the largest in the present upswing of our overseas trade in automotive equipment. Motorcycles alone in November represented higher figures than in the preceding month. Passenger car exports for November were one-tenth smaller in number than in October and motor trucks declined about one-fourth.

The figures for the November sales follow:

	No.	Value	Unit Value
Passenger cars			
Completed vehicles	1,616	\$1,509,143	\$934
Chassis	459	338,047	736
Total	2,075	\$1,847,190	890
Motor trucks			
Completed vehicles	226	\$192,094	850
Chassis	201	172,300	857
Total	427	\$364,394	853
Parts		\$2,546,424	
Motorcycles	500	144,696	286
Airplane parts		19,173	

The largest importer of American passenger cars, as in the previous month, was Mexico, followed by Australia, Canada and the United Kingdom. Mexico likewise leads the list in the purchase by

number of motor trucks, followed by Japan, British Oceania, Canada and The Netherlands. By value, the truck purchases went to Mexico, Canada, British Oceania, Japan and the Philippines. Details covering the shipments of parts were not announced.

## McQuay-Norris Acquires Business of Wainwright

ST. LOUIS, Dec. 27—The McQuay-Norris Mfg. Co. of this city, manufacturer of piston rings, announces that it has acquired the plant and business of the Wainwright Engineering Corp. of Connersville, Ind., which manufactures Wainwright pistons and pins. The business will be continued in Connersville under the name of the McQuay-Norris Mfg. Co. of Indiana. Plans are already under way for plant changes and additions to increase the output.

Harry A. Wainwright, who has been the active head of the Wainwright Corp., will become treasurer and general manager of the new Indiana company and will continue as general manager of the Connersville plant. Paul J. Barnard, vice-president and sales manager of the Wainwright company, will be secretary of the new company. Sales will be taken over by the McQuay-Norris Mfg. Co., which has 15 branch offices and thirty-five field representatives.

## Benz Works, Mannheim, Buy Rumber Patents

BERLIN, Dec. 12 (By Mail)—The Benz works at Mannheim, producer of high quality cars and the "Blitzen Benz," have decided, after exhaustive tests of the Rumber car, to buy the sole license for Germany of the Rumber patents. The tests lasted for about six weeks, during which the 30 hp. Rumber car was compared with 50 to 60 hp. Benz and other cars of similar quality in speed, hill climbing, fuel consumption, tire consumption, comfort of passengers, etc.

## Registrations Show Increase in Oregon

Cars Gain 14 Per Cent During Year; Growth Greater in Trucks

PORTLAND, ORE., Dec. 17—Latest registration figures for automobiles and motor trucks in the State of Oregon show a gain of 14 per cent in the number of automobiles since the first of the year and a gain of 15 per cent in trucks. On Jan. 1, 1921, there were 103,414 automobiles, while at the present time there are 118,169, a gain of 14,755. Trucks at the beginning of this year numbered 12,856, while they now number 14,747, an increase of 1889.

The figures show a steady and substantial sale of motor vehicles throughout the year, and the fact that trucks showed a percentage gain slightly greater than automobiles came as a surprise.

## Agricultural Districts Decline

Analysis of the figures shows that the larger towns and cities and industrial areas of the State showed practically all the gain in automobiles, the agricultural communities presenting little increase and in some instances loss in vehicles registered. Forty per cent of the gain was in Multnomah County (Portland). Eastern Oregon, the agricultural section of the State, showed a loss of 1 per cent in registrations.

Sales of new cars throughout the State showed a considerable slackening up in November as compared with October, while December is not expected to run ahead but possibly may fall a little behind November. During November 25½ cars per day on the average, or a total of 777 new cars, were sold, as compared with 49½ per day, or 1485 for October. This is for the entire State, but the same ratio holds true in Portland, where approximately one-half of the new cars are sold.





Reg. U. S. Pat. Office

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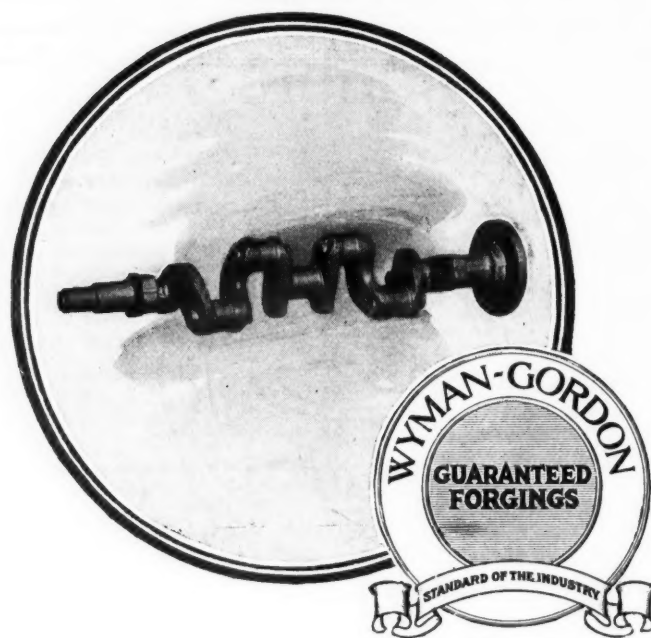
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# AUTOMOTIVE INDUSTRIES

**AUTOMOBILE**  
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239 WEST 39th STREET NEW YORK CITY

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# "NORMA"

## PRECISION BALL BEARINGS

(PATENTED)

The useful life of a "cheap" car, or truck, or tractor, or power boat, is usually so short that its first cost is still a vivid memory. On the other hand, with automotive units of the better class, the term of useful service is so long that first cost is forgotten. It is in cars, trucks, tractors and power boats of the latter class that "NORMA" equipped ignition apparatus and lighting generators are found. Their performance helps to put price—first cost—so far behind as seldom to be recalled.

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Long Island City  
New York



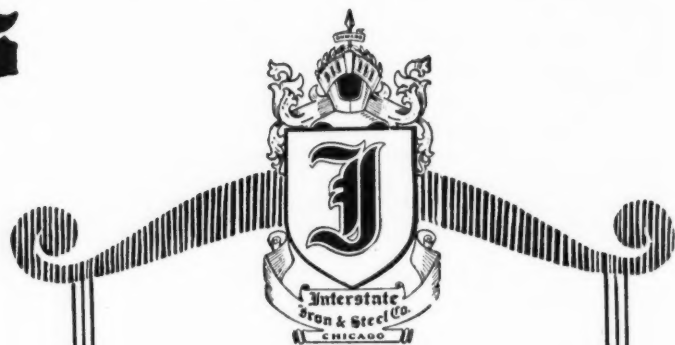
Ball, Roller, Thrust and Combination Bearings

# Interstate

## Refined Basic Open Hearth Alloy Steels

THE acceptance of Interstate Basic Open Hearth Alloy Steel, by an increasing number of Automobile, Motor Truck and Tractor Manufacturers, because of fully meeting their exacting specifications is a matter of pride with us. We ascribe this enviable record to the following causes:

1. Skill of our metallurgists in developing and conducting refining processes in the furnaces, during the melting period.
2. Use of carefully selected raw materials, properly combined in each heat, with special reference to the analysis sought.
3. Specialized design and equipment of our Basic Open Hearth Alloy Steel plant at South Chicago—a well-balanced, scientifically-correlated UNIT for the production of one class of product—REFINED ALLOY STEEL.
4. The definite purpose of the whole Interstate organization to make QUALITY paramount; and thus to earn a reputation for INTERSTATE PRODUCTS that shall insure a demand for our maximum tonnage.



### Interstate

#### Refined

#### ALLOY STEELS

*are furnished in the following forms:*

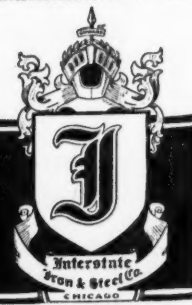
Bars, Billets, Slabs, Blooms, Spring Sections, Cold Drawn Bars, Annealed and Heat Treated Bars, Wire Rods, Wire, Wire Products.

....

In Chrome, Chrome-Vanadium, Chrome-Nickel, Chrome-Molybdenum, ½%, 1%, 3½% and 5% Nickel and Silico-Manganese.



**Interstate Iron and Steel Co.**  
104 South Michigan Avenue, Chicago





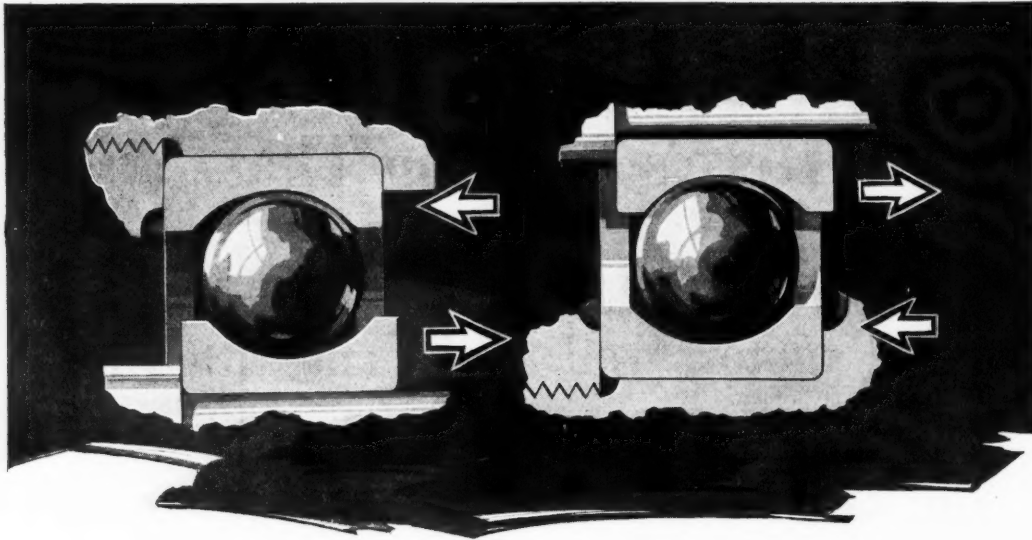
## For 1922 Here's Wishing That

**W**E may be as powerful as a clean motor, well made, and fitted for the job; running smoothly regardless of any outside conditions, with much reserve as an accelerator capable of all emergencies, but wasting nothing.

Lubricated with good will and cooperation, moving freely, without stop or interruption.

Governed by the spark of intelligence, at the full heat of initiation, timed for the right work at the right place.

HARRY TIPPER


**SKF**


## The Deep Groove Radial Bearing as a Heavy Thrust Carrier

**W**HEREVER radial and thrust loads are carried in combination, the deep groove bearing is the logical as well as the practical choice. The exaggerated view above shows how such combined loads are transmitted.

The thrust capacity of the deep groove bearing is at least as high as its radial capacity and for average speeds may exceed the radial rating of the bearing. Moreover the deep groove bearing is a reversible thrust carrier—it will successfully operate when mounted either way.

The deep groove bearing is especially adapt-

able to locations where the radial and thrust components are subject to continual variations. All parts of the bearings are designed to withstand these varying conditions. This means adequate bearing service and consequently increased life for your machine.

The deep groove bearing is a product of The Hess-Bright Mfg. Co. and is sponsored by the **SKF** Industries, Inc. Its manufacture embodies all the minute care, precision and quality for which the mark **SKF** stands. The world-wide experience of this organization is put at your disposal, free of any obligation on your part.

## THE HESS-BRIGHT MANUFACTURING CO.

Supervised by **SKF** INDUSTRIES, INC., 165 Broadway, New York City

705





# This Year at the Shows



*In New York  
January 7 to 14  
at the  
Commodore  
Hotel  
Suite 1200 1-2*

the Ternstedt exhibit will be of particular interest to everyone connected with the building of better bodies.

It is the finest and most comprehensive line of body hardware that it has ever been our privilege to display.

The many new and improved items of hardware equipment, new methods of application, new thoughts in modern body construction, will claim the attention of every progressive body builder.

Mr. Seiler, Mr. Humphrey, Mr. Archer, Mr. McPhail, Mr. Braffett—Ternstedt men, you all know well—will be there to extend to you a cordial welcome.

It's a splendid opportunity to renew old friendships and absorb some new ideas.

Don't forget the locations—the Commodore in New York, the Congress in Chicago. Make it a point to see this new line of



*In Chicago  
January 28 to  
February 4  
at the  
Congress Hotel*

## TERNSTEDT

### *Automobile Body Hardware*

...BUILT • BETTER • FOR • BETTER BODIES...



REG. U. S. PAT. OFF.

*Largest Manufacturers of Automobile Body Hardware in the World*

# EATON

CHARLES GUERNSEY, CHIEF ENGINEER, SERVICE MOTOR TRUCK CO.,  
WRITES UNDER DATE OF OCTOBER 6, 1921:

Gentlemen:

Your Model 1000 axle has come through *with an absolutely clean score* on all of the many severe tests to which our Model 15 truck has been subjected.

*High Speed  
One-Ton Truck  
Makes Record*

Among these tests may be mentioned a 1200 mile trip through the Alleghany Mountains and back to Wabash; a trip of 369½ miles from Wabash to Lima, Ohio; thence to Dayton, Richmond, and back to Wabash, on which trip the average speed (exclusive of time and mileage within the cities) was 35½ miles per hour. About one-half of this trip was made in the rain.

*Model 1000 Axle  
Comes Clean*

The sample axle under the experimental truck has been driven some 15,000 miles. During this time the bearings have been once adjusted and the brakes once relined. During these tests the experimental truck has carried anywhere from 1500 to 4000 pounds net load. The engine used ahead of this axle develops 39 H.P. and 1800 R.P.M. and, consequently, is capable of inflicting *considerable punishment on the rear axle.*

The truck has been in production some seven months, and we have yet to have any serious difficulties from the field.

As a result of the above you can well appreciate that *I am thoroughly sold* on your Model 1000 axle.

Yours very truly,

CHARLES GUERNSEY,  
Chief Engineer,  
The Service Motor Truck Co.

THE EATON AXLE COMPANY, CLEVELAND, OHIO  
DIVISION OF THE STANDARD PARTS COMPANY

OTHER DIVISIONS ARE: THE PERFECTION SPRING COMPANY, THE  
BOCK BEARING COMPANY, THE STANDARD WELDING COMPANY

# AXLES





# Fitted as Finely as a Tappet

Like a valve tappet in its guide, a Lavine "Pilot" trunnion block must be an *oil fit* in its slot.

The block itself is a typical bit of Lavine workmanship. It is made of chrome alloy steel, hardened and ground all over. Through five distinct operations it is held to limits of .001" plus or minus.

This precision workmanship assures smooth travel of the trunnion block in its slot in the sliding head—plays a big part in the silky action and great durability of the Lavine "Pilot"—*the new standard of steering gear value.*

To discriminating car manufacturers this gear is offered as the masterpiece of a "hand picked" organization of gear specialists. The more carefully you compare the Lavine "Pilot" with other good steering gears the more you will appreciate the "Pilot's" greater durability, simplicity, smoothness of action, ease of adjustment and freedom from rattling. We invite competitive tests on these points.

**LAVINE GEAR CO.**

MILWAUKEE, WIS.



**LAVINE**  
**"PILOT"**  
**STEERING GEAR**

Manufacturers, let us exchange specifications. Send us your blue prints, without obligation. Know the Lavine "Pilot" better—probably you over-estimate its price!



THE high carbon chrome alloy steel of which New Departure Ball Bearings are made is fundamental of New Departure guaranteed QUALITY.

The New Departure Manufacturing Company  
Detroit      Bristol, Conn.      Chicago

CONRAD PATENT LICENSEE

**New Departure  
Ball Bearings**

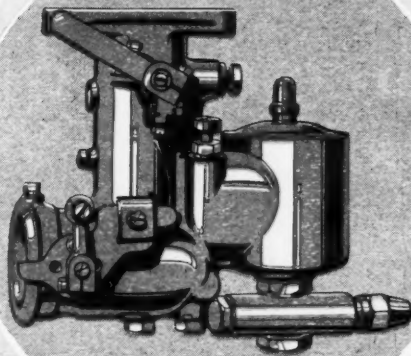


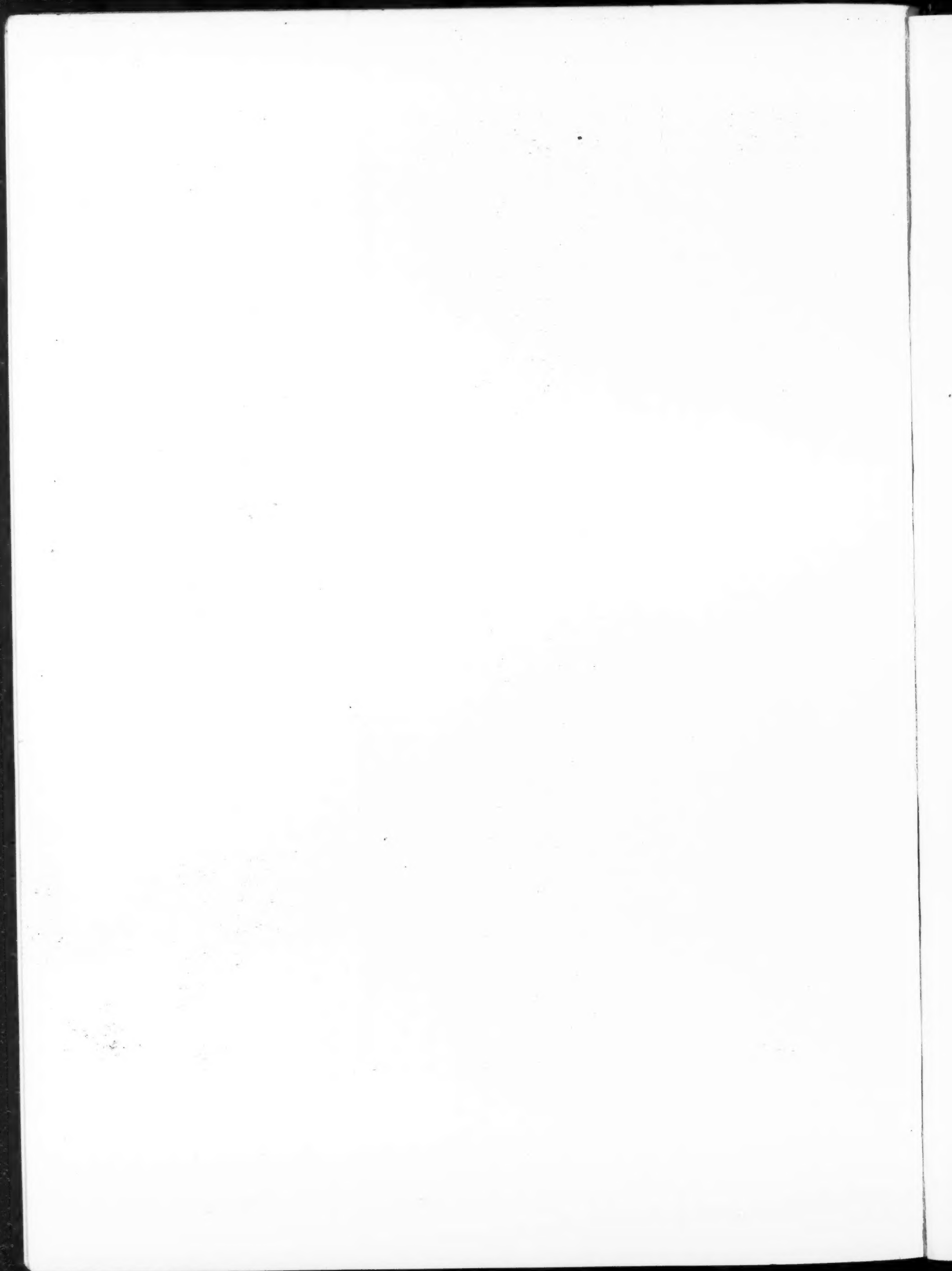


**Engineers care little about words, but they do care about works. That's why we urge tests rather than tales for the new Holley Carburetor.**

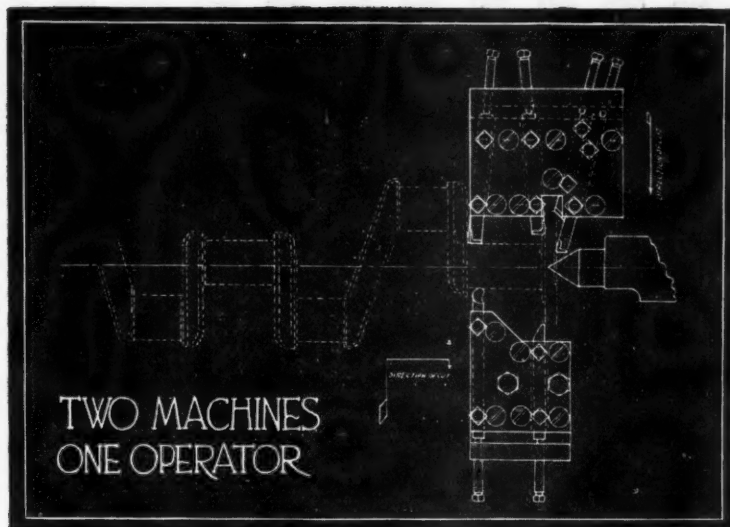
HOLLEY CARBURETOR COMPANY, DETROIT

*The new* **HOLLEY**  
CARBURETOR



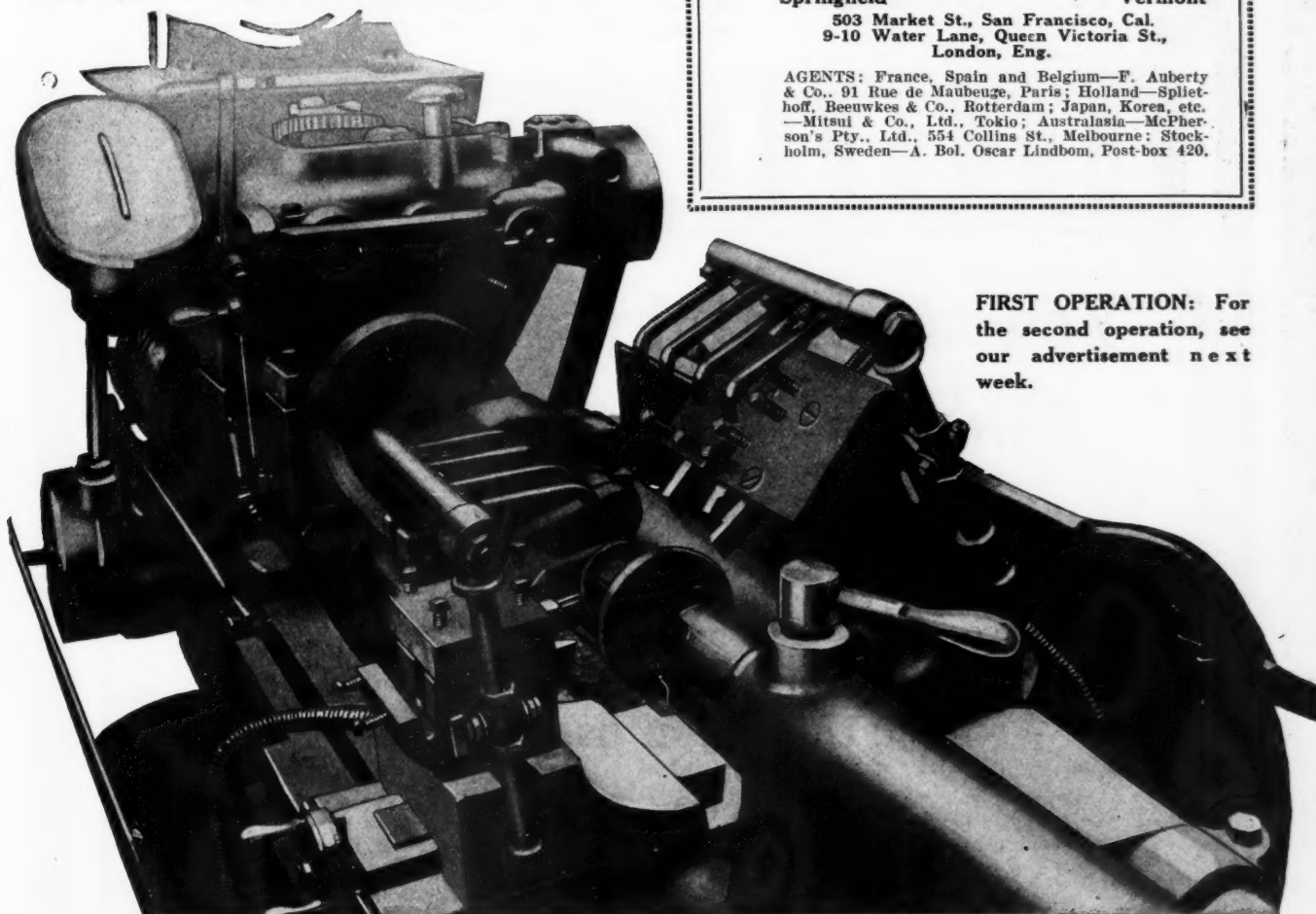






### The FAY-WAY of Machining CRANK SHAFT ENDS

is outlined here. The Fay Way is equally as efficient in machining a great variety of automotive parts. Our engineers will be glad to co-operate with you in devising better methods in production of your standardized parts. Send sample piece or blueprints to us for estimate.



Fourteen tools, cutting simultaneously, finish both ends in time of longest cut—

#### Two machines—one operator

The crankshaft is held between centers in a special fixture and supported by a pot chuck. The carriage rocks in and moves toward the tailstock, turning outside diameter of flange and end bearing. The back arm rocks in and faces, as shown.

This completes the cuts on one end, after which the shaft goes to another Fay Automatic and the other end is finished. One operator handles the two machines and as the machines are both cutting at the same time, the crankshaft ends are finished in the time of the longest single cut, which gives a production, from floor to floor, of twenty shafts per hour.

### JONES & LAMSON MACHINE CO.

Springfield Vermont  
503 Market St., San Francisco, Cal.  
9-10 Water Lane, Queen Victoria St.,  
London, Eng.

AGENTS: France, Spain and Belgium—F. Aubert & Co., 91 Rue de Maubeuge, Paris; Holland—Splet-hoff, Beeuwkes & Co., Rotterdam; Japan, Korea, etc.—Mitsui & Co., Ltd., Tokio; Australasia—McPherson's Pty., Ltd., 554 Collins St., Melbourne; Stockholm, Sweden—A. Bol. Oscar Lindbom, Post-box 420.

FIRST OPERATION: For the second operation, see our advertisement next week.

# FAY AUTOMATIC LATHE

## **MUELLER** **Forges Brass!!**

Made under 400,000 pounds pressure,  
**MUELLER** Brass Forgings are as  
fine grained as tool steel are 80%  
stronger than sand castings and  
cost less. You should try them.

## **MUELLER Forges Brass!!**

## **You can profit by sixty years of **MUELLER** experience**

All the knowledge of Brass which  
**MUELLER** has gained is yours  
for the asking and without obliga-  
tion. Write **MUELLER** for prices  
on anything you use in Brass.

**MUELLER METALS CO., PORT HURON, MICH.**

Sales Offices: New York, Philadelphia, Buffalo, Pittsburgh, Cleveland, Dayton,  
Detroit, Indianapolis, Chicago, Minneapolis, New Orleans, San Francisco.

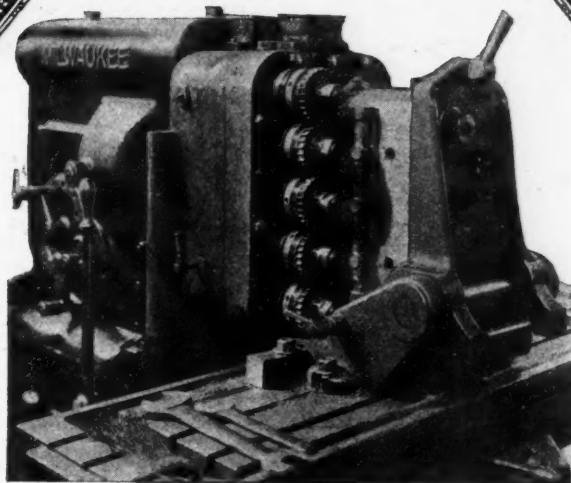
Makers of "Red Tip" Brass Rod; Brass and Copper Tubing; Forgings and Castings in Brass, Bronze  
and Aluminum; Die Castings in White Metal and Aluminum; also Screw Machined Products.

H. Mueller Manufacturing Co., Decatur, Ill., and Sarnia, Ont.  
Makers of Water, Plumbing and Gas Brass Goods and Tools.



# On the Oldsmobile Eight

*There are probably  
no plants in the  
country surpassing  
in equipment the  
new plants of the  
Olds Motor Works*



Economy, accuracy and record results feature production on the new Model 47 Oldsmobile in the new plant of the Olds Motor Works, Lansing, Mich.

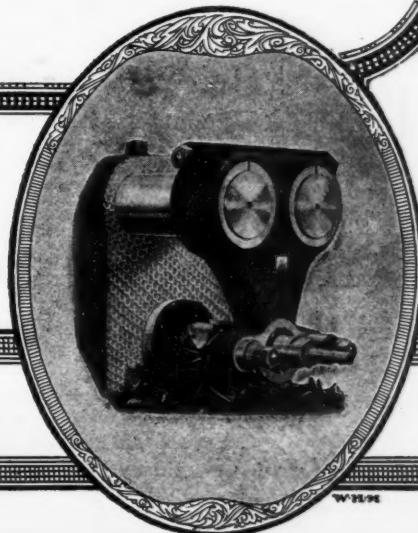
171 blocks per day are being produced in the cylinder block department with an average of 16 pounds of metal removed from each block.

The picture is of a Milwaukee 3B Milling Machine provided with five cutters, milling the intake manifold flange. This Milwaukee takes both the rough and finish cuts on all the blocks. It is capable of handling from 20 to 25 blocks per hour. Another Milwaukee, with a single cutter, mills eight bolt hole faces and spot faces two bolt holes.

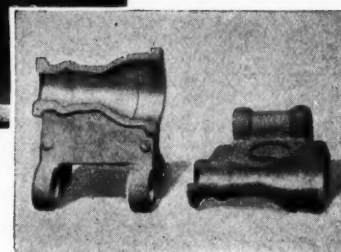
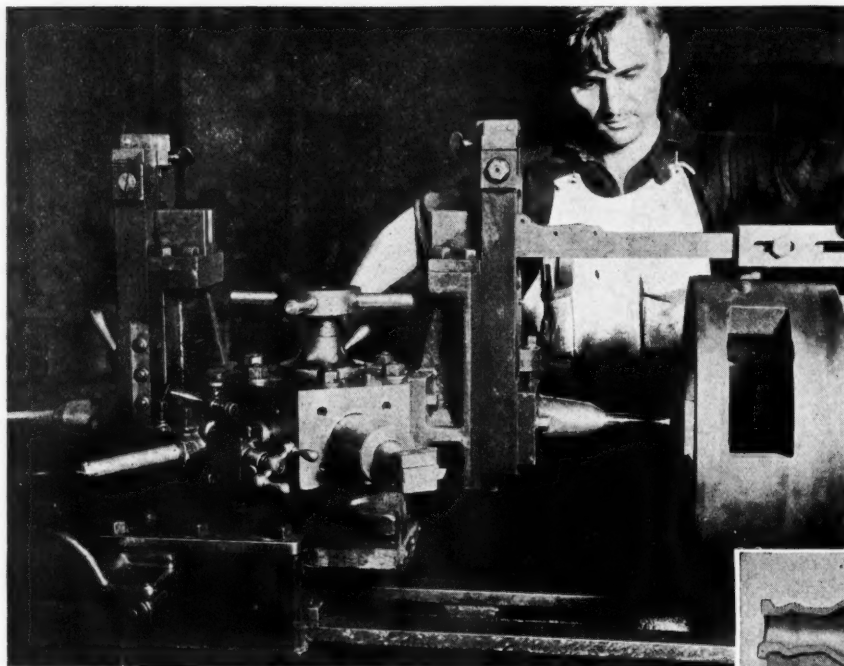
The wide use of Milwaukee Milling Machines in the automotive industry compels the belief that they "make good." For information on your next installation of milling equipment, dictate a request for Catalog 22.

Branch offices in Chicago, Cleveland, New York.

KEARNEY & TRECKER  
CORPORATION  
MILWAUKEE, WIS., U.S.A.



**The Double Overarm maintains  
permanent alignment of the arbor.**



## Consult Our Production Engineers

A production man from a large factory, which has a reputation for its up-to-date production methods, put the problem to us this way:

"We must reduce the cost of finishing these moulds for electric light bulbs. It is not customary to finish them on turret lathes, but we think *your* turret lathes can do the work as well and in less time."

(They have Warner & Swasey turret lathes in their shop doing other work.)

The turret lathe and tools we furnished do the work in one-fifth the previous time. And their operator expects to do better than that when he becomes accustomed to the job.

You have jobs that should cost less. Send us blue prints of them. You'll be surprised at the saving we can show you.

# The Warner & Swasey Company

Cleveland, U. S. A.

BRANCH SALES OFFICES

NEW YORK: Singer Building    BUFFALO: Iroquois Building    BOSTON: Oliver Building    DETROIT: 5928 Second Boulevard  
CHICAGO: 618-622 Washington Boulevard    MILWAUKEE: 209 Sycamore Building  
DAYTON: 518 Mutual Home Building    INDIANAPOLIS: 940 Lemcke Annex



# Begin Now to Sell Automobiles to Farmer-Oklahomans in 1922



## Here Is Proof

—that Oklahoma is one of the very best farm markets, *right now*:

For three consecutive years Oklahoma has led the country in composite condition of all crops.

The two chief crops, wheat and cotton, were marketed at peak prices together with a big "carryover" from last year.

The bulk of the wheat crop was marketed at \$1.15 to \$1.20 a bushel. Wheat is lower now, but farmers have none to sell.

Feed and food crops are abundant. Thus, livestock raisers are able to carry their animals through the winter cheaply. Dairy farmers are particularly favored.

Oklahoma's cotton acreage was only one-third as large as in 1920, yet the growers received two-thirds as much money for the crop. Moreover, the entire crop was economically produced with an expectancy of ten-cent cotton. Imagine the change in the farmers' buying attitude when the crop brought 20 to 22 cents.

Nineteen twenty-two will witness a return to full farm prosperity in Oklahoma.

May we send you other convincing facts regarding the Oklahoma farm market for automotive equipment?

THE dawn of 1922 finds Oklahoma one of the best farm markets in the entire country. Farmers of few other states received as near a normal income from their 1921 crops. And the farmers of Oklahoma expect an even closer approach to normal in 1922.

They are optimistic, they have come through the depression successfully. Now they are making plans for purchases and improvements to make 1922 a year of undisputed prosperity.

Farmer-Oklahomans have the money to buy the things they need to make farm life livable and profitable, although they are conservative in their tastes and cautious in making purchases.

To stand the inspection of the farmers of Oklahoma, an automobile must be of known quality, backed by a reliable manufacturer and adapted to the heavy service imposed by farm use. The way to secure their interest in your car is to make known its past performance through the Oklahoma Farmer-Stockman, the farm paper trusted and respected by Oklahomans.

Only after gaining their confidence can you be the manufacturer who will sell them the automobiles they need and will buy this spring.

To interested manufacturers we will gladly furnish a complete analysis of the Oklahoma farm market, evidence of conditions, and an authoritative forecast of what 1922 holds for the automotive manufacturer.

## The OKLAHOMA FARMER-STOCKMAN

CARL WILLIAMS, Editor

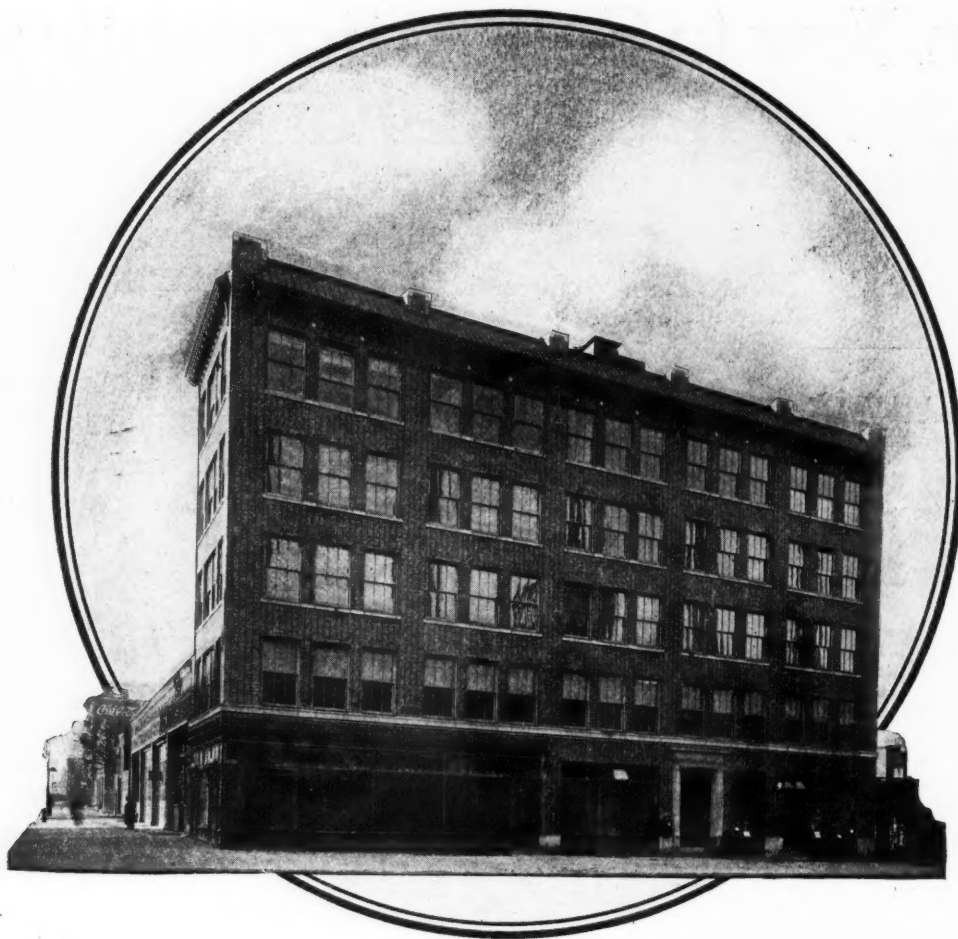
EDGAR T. BELL, Adv. Mgr., Oklahoma City

Member A. B. C.

National Representatives:

E. KATZ SPECIAL ADVERTISING AGENCY

New York Chicago Atlanta Kansas City San Francisco



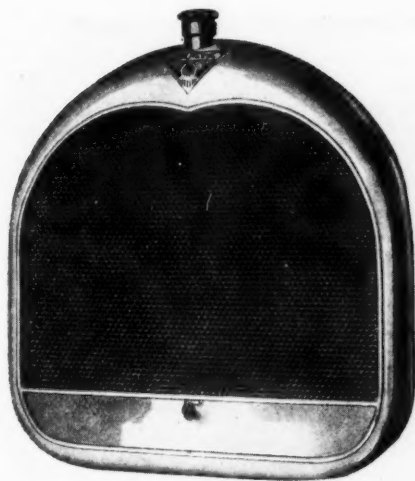
## *Announcing the Opening of a New York Branch and Service Station*

**T**HE U. S. Cartridge Company is now operating a New York branch and service station at 600 West 57th Street.

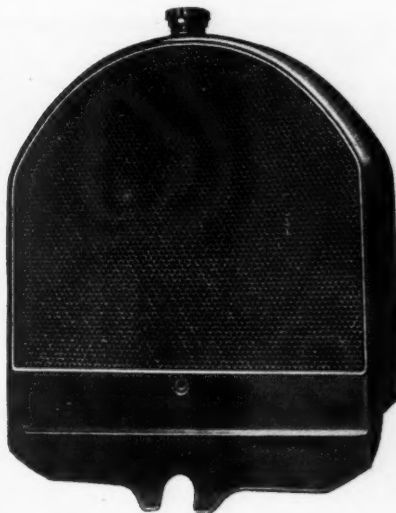
The company has acquired the premises and equipment which for the past several years have been operated by the Ansted Company of New York in the production of radiators for finely appointed motor cars and airplanes.



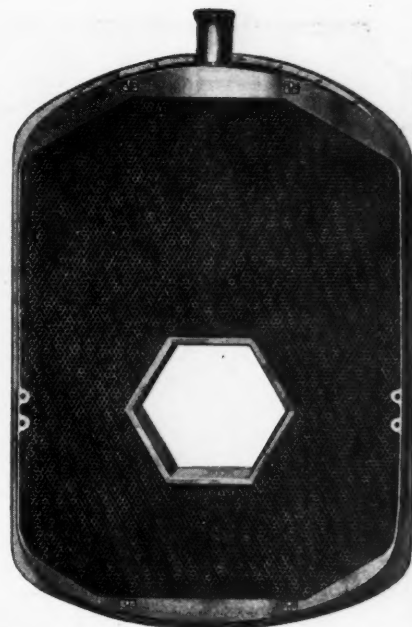




*Cartridge-Core Equipped  
Simplex.*



*Cadillac Equipped With Rushmore Steam  
Cooling System, Using U. S.  
Cartridge Cores.*



*Cartridge-Core Airplane  
Radiator.*

The business will be continued and expanded by the U. S. Cartridge Company, with its activities divided into four functional groups.

(1) The manufacture of complete radiators for the highest type of passenger cars, the plant being especially well organized for this class of work.

(2) As a service station for the building and installation of radiator cores for truck fleet owners, garages and repair shops, as well as for individual car and truck owners.

(3) The building of special complete radiators for body makers and car owners.

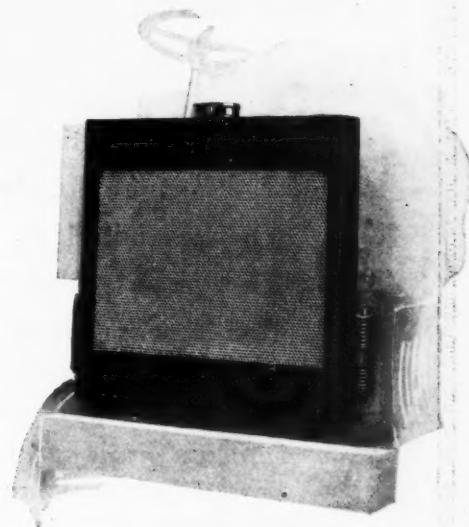
(4) Production of radiators for all types of aircraft.

UNITED STATES  CARTRIDGE CO.  
Lowell Mass.

*New York Branch and Service Station*

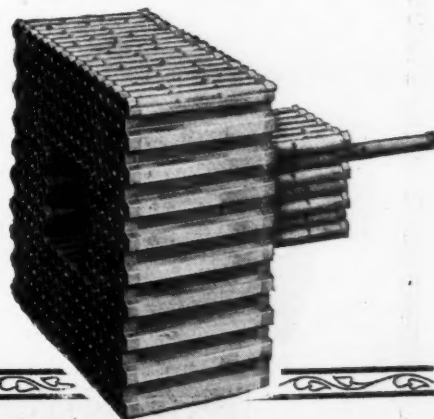
*600 West 57th Street*

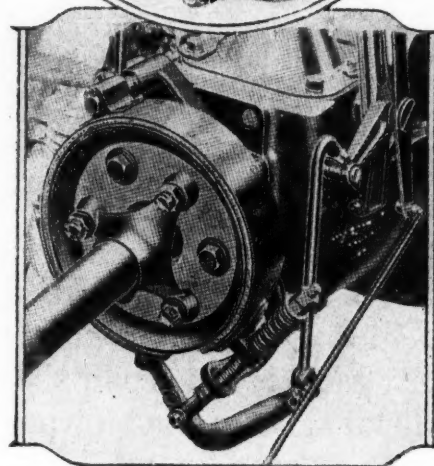
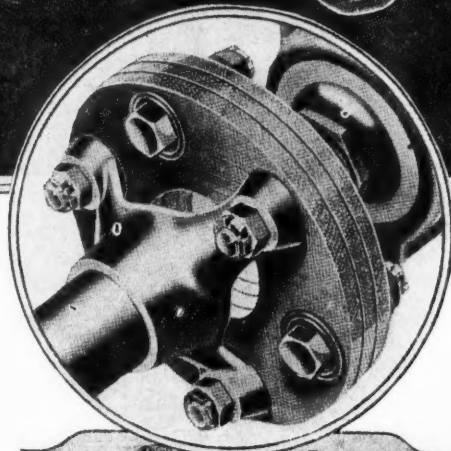
*Telephone Circle 7610*



*One of the principal reasons for opening  
the New York Branch was to provide prompt  
and efficient service to fleet owners.*

**Cartridge  
CORES**





## Why Snead Cushion Drives are the best universal joint assemblies—

They are half the ordinary weight;  
They require no lubrication;  
They are noiseless;  
They absorb shock and power impulses;  
And increase life of gears and bearings.

*Attractive prices and prompt deliveries  
Write for recommendations*

*Illustrations showing  
Universal Joint at Trans-  
mission and at axle end.*

### SNEAD & COMPANY

*Founded 1849*

JERSEY CITY - - NEW JERSEY

# SNEAD

## CUSHION DRIVE

*Takes the Self-destruction Out of Your Car.*



# TIMKEN

## *Tapered*

# ROLLER BEARINGS



### F r i c t i o n

Friction, from the beginning of time, has controlled man's progress, either as a friend or as an enemy.

Earliest evidence of the friendly use of friction was the rubbing of the hands and body to keep warm and finally the rubbing of a pointed stick to start a fire. But friction, like the fire which it starts, is, in many ways, man's formidable enemy.

In the operation of machinery and in the development of all automotive vehicles, friction must be held absolutely under man's control; or else, the mechanical power which has carried man from savagery to his present high estate, would be so wasted as to hold progress and development at a standstill.

Without anti-friction bearings (as they are called) machinery in general would have remained as in great-grandfather's day. No railroads would streak across the land—no motor cars—no trucks—not even power-driven boats could ply.

In this battle, against "enemy" friction, human inventive genius has progressed rapidly from the early cumbersome types of soft, slippery metal collars which encircled axles and shafts—through various applications of balls and rollers—to the tapered roller bearing of today, as typified in the product of the Timken Roller Bearing Company;—

It has progressed from those early nuisances that required greasing or oiling every few hours to the Timken Tapered Roller Bearing of today that requires attention as infrequently as every year or two.

Here we have a light, compact and self-contained device that is friction's absolute master. For not only do Timken Tapered Roller Bearings hold friction to a negligible minimum—

But in so enabling wheels and shafts to revolve at frightful speeds with ease and safety—

Timken Tapered Roller Bearings, at the same time, carry all the loads that may be thrust upon them regardless of the direction from which these loads may come. No matter how, nor where, nor when that shock or load is applied—

Your Timken Tapered Roller Bearings rest snugly in their various housings, absorbing or deflecting those blows—

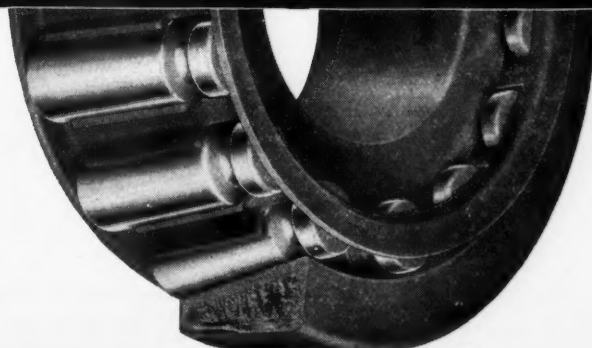
The while your motive power is being delivered through these bearings, without interruption, to the driving wheels—

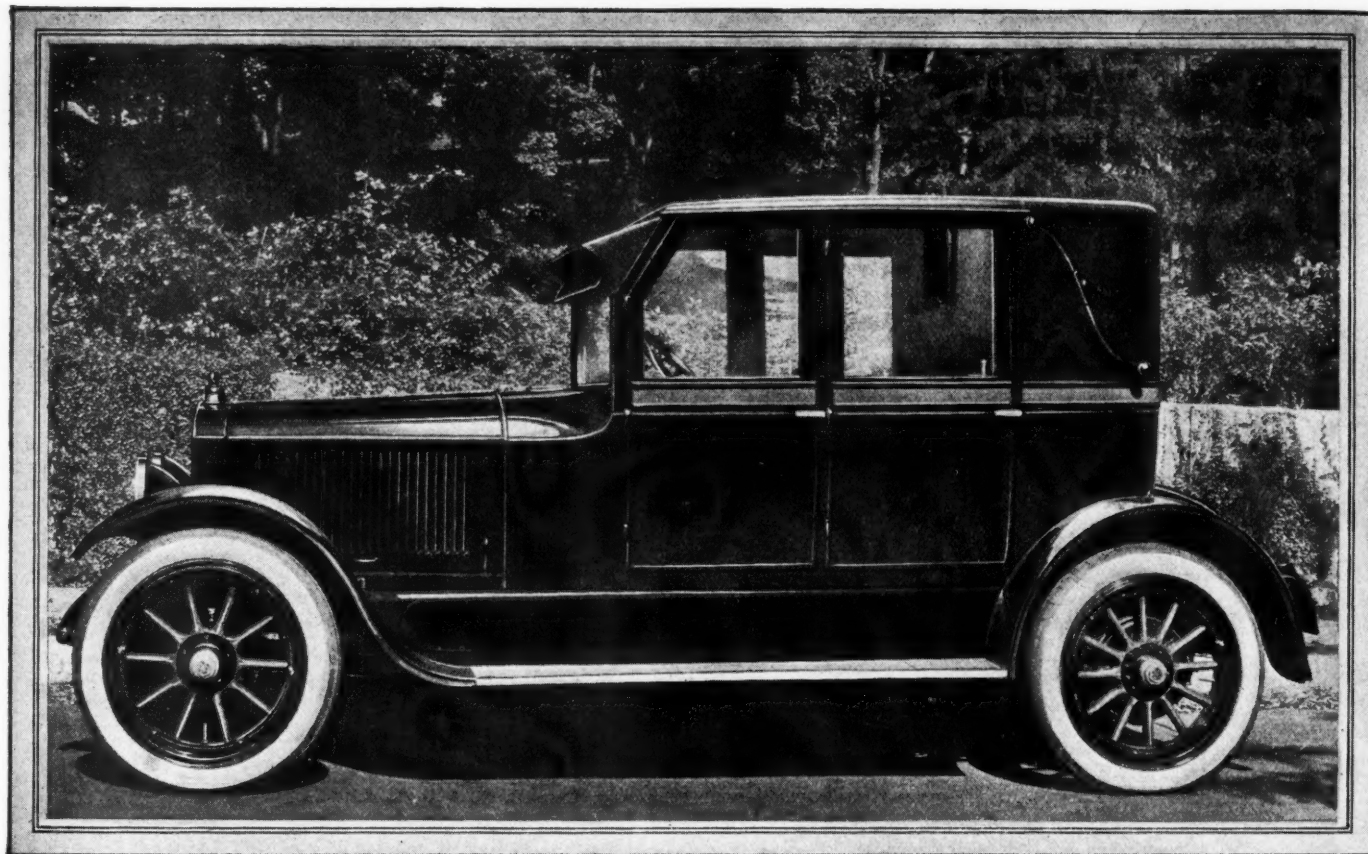
And finally, when that wear which *must* follow all motion becomes apparent,—a simple adjustment and your Timkens function as when new.

**THE TIMKEN ROLLER BEARING CO, CANTON, OHIO**

*Timken Tapered Roller Bearings for Passenger Cars, Trucks, Tractors, Trailers, Farm Implements, Machinery, and Industrial Appliances*

SEND FOR TRUTH-TESTED FACT #2, "FRICTION"





## *The Body That Sells the Car*

***Raulang***  
TRADE MARK  
AUTOMOBILE  
BODIES

*Raulang Bodies are now  
available in these models:*

REO COUPE  
REO SEDAN  
LEXINGTON "S" SEDAN  
RAUCH & LANG BROUGHAM  
RAUCH & LANG COACH  
STANLEY SPORT SEDAN  
BIDDLE SEDAN  
BIDDLE TOWN CAR

In the closed car market of today the body is of paramount importance in the appeal to the customer.

Raulang Closed Bodies have a national prestige which cannot be denied. They are quantity-built coach bodies—and, through the permanent satisfaction they ensure the owners, promote retail sales for car builders.

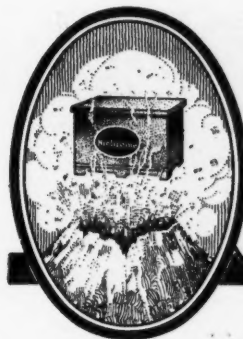
Distinctive in design and appointments, built to outlast the chassis, and marketed at prices little if any in excess of those for ordinary bodies.

---

Raulang Body Division of THE BAKER R & L COMPANY, Cleveland, Ohio, U. S. A.

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# Nichrome

TRADE MARK REG. U. S. PAT. OFF.

## Heat Treating Containers

*Endure in High Temperatures*

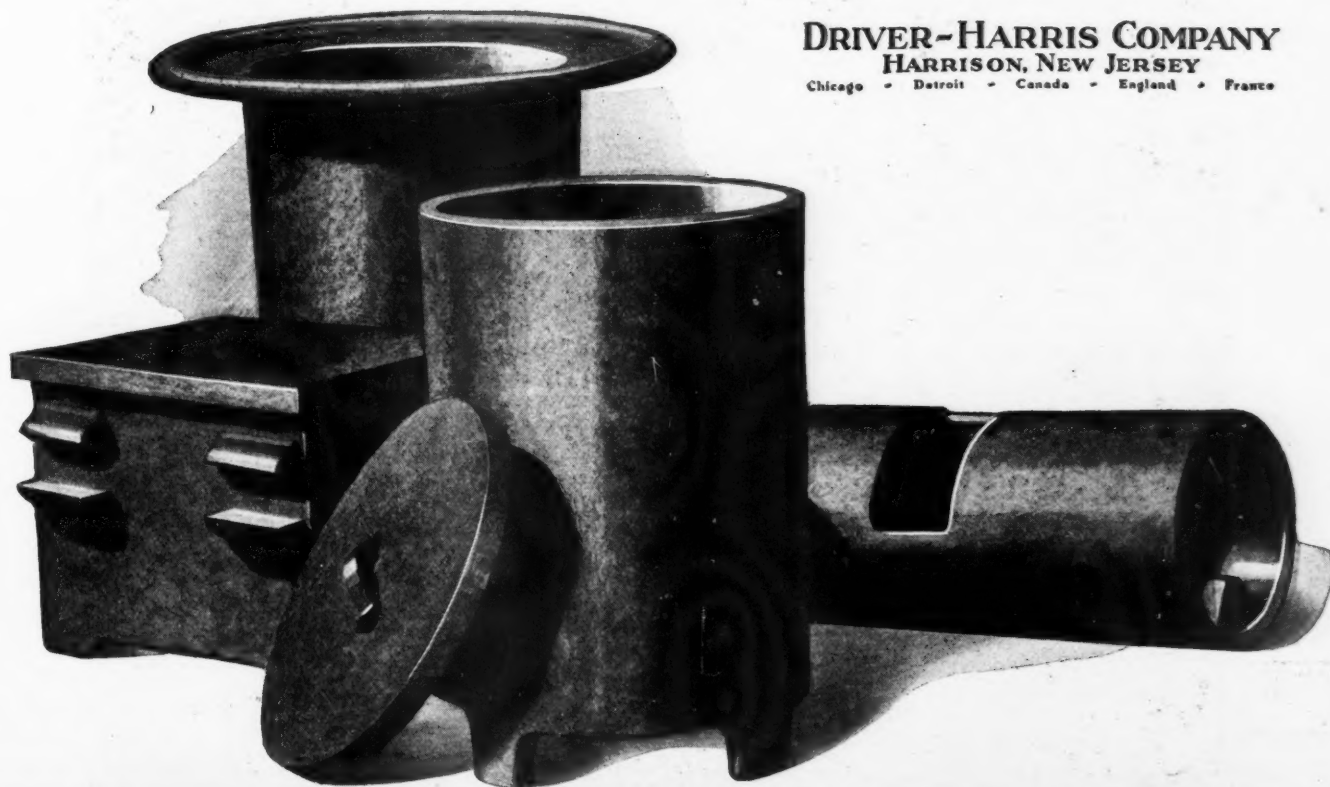
**Q**UALITY or ECONOMY—which is of greater importance to you? Pretty hard to say, isn't it? In the final analysis quality and economy are mighty close to twin brothers, and both must be measured in terms of service.

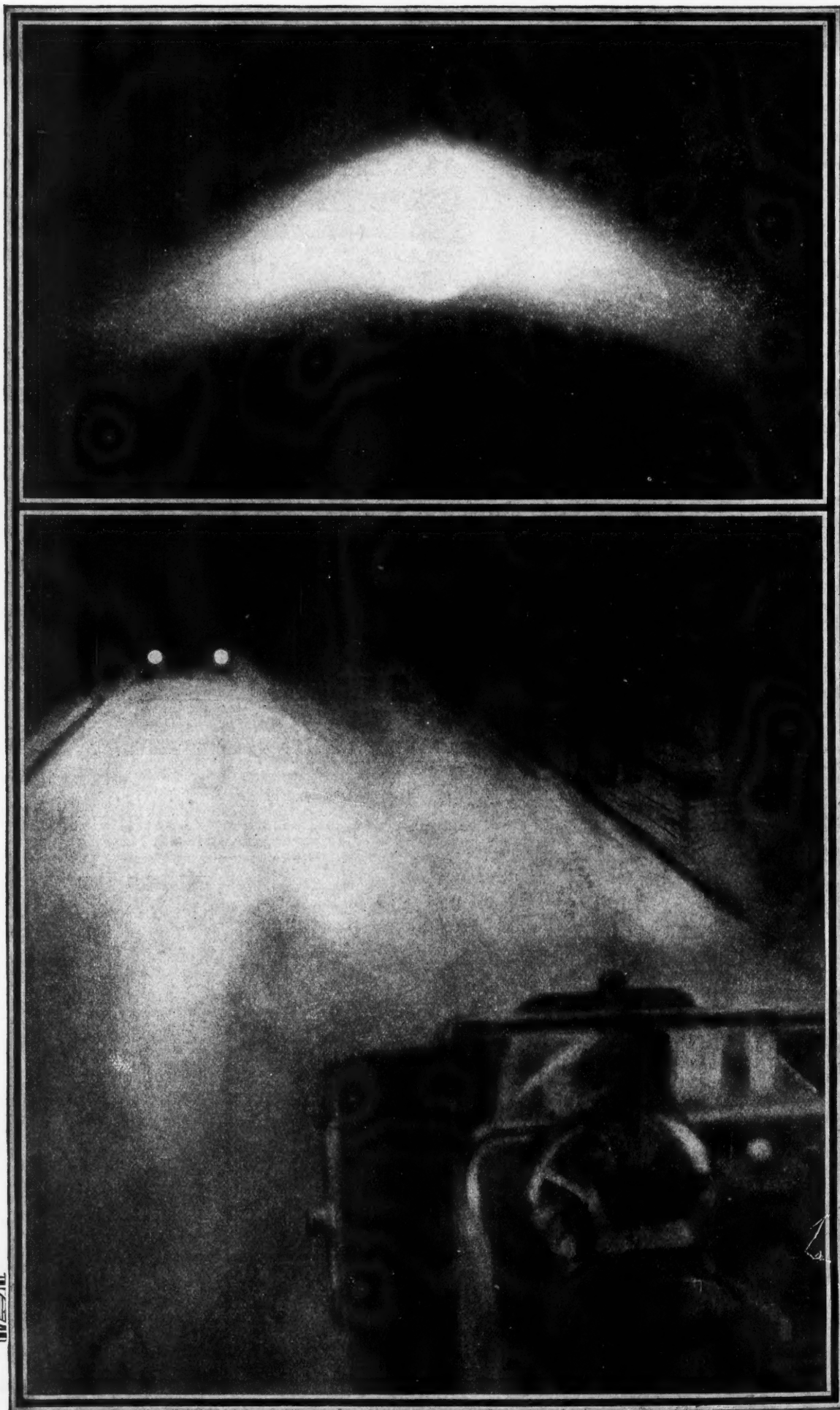
How well the case-hardened part performs its function, on an average, depends on how the various elements in the carbonizing process "average up." Keeping down spoilage and maintaining a fairly accurate uniformity of case, heat after heat, calls for containers that not only give long service but behave in a uniform way throughout their entire usefulness.

From every angle that affects either quality or economy, Cast Nichrome Containers average up to the highest satisfaction point. The proof exists in hundreds of modern plants.

*All Cast Nichrome Containers are  
Manufactured under HENDERSON Patents by*

**DRIVER-HARRIS COMPANY**  
HARRISON, NEW JERSEY  
Chicago • Detroit • Canada • England • France







## Nolenz Headlight at the New York Show

**A**T our booths every courtesy will be extended to car and truck engineers, designers and factory heads in general. For their information every detail of reflector design, and other patented features will be thoroughly discussed. All matters relating to special forms of lamp design and finish will also be brought to the attention of those interested.

*See This Exhibit in  
Spaces D-84 and  
D-114*

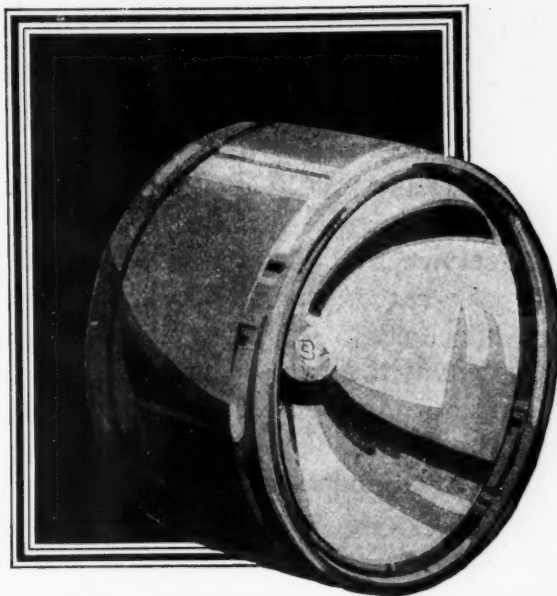
Nolenz is the final scientific development in road lighting.

It gives even, widespread and ample light volume for driving, side and ditch illumination.

It is equipped with a plain cover glass front for reflector and lamp protection only.

It can be aimed at any angle and then securely locked. No bolt breaking wrench is necessary.

Focus adjustment is made by hand screws back of the reflector. This device also locks the precision socket and lamp.



The reflector is made under the Bart patented process and is guaranteed for three years against tarnish and rust.

---

*Be Sure to See the  
Demonstration at  
Show Spaces Noted  
Above*

---

**AUTOMOTIVE UTILITIES MFG. CORPORATION**

GOTHAM BANK BLDG.  
COLUMBUS CIRCLE  
NEW YORK

# NOLENZ

**The Eventual Head Light**

# PASSENGER CAR "SIX" Beaver

## Quality Power Plants

The most important unit in an automobile is its motor.

It is the index to the car's character. It determines, more than anything else, the reputation the car will have with the buying public.

A fine automobile must have a fine motor.

Beaver Engines are built to be fitting power plants for the finest motor cars. They give the smooth-flowing tremendous power that is so necessary. They are of the valve-in-head type with the faults found in less carefully built motors of this type eliminated.

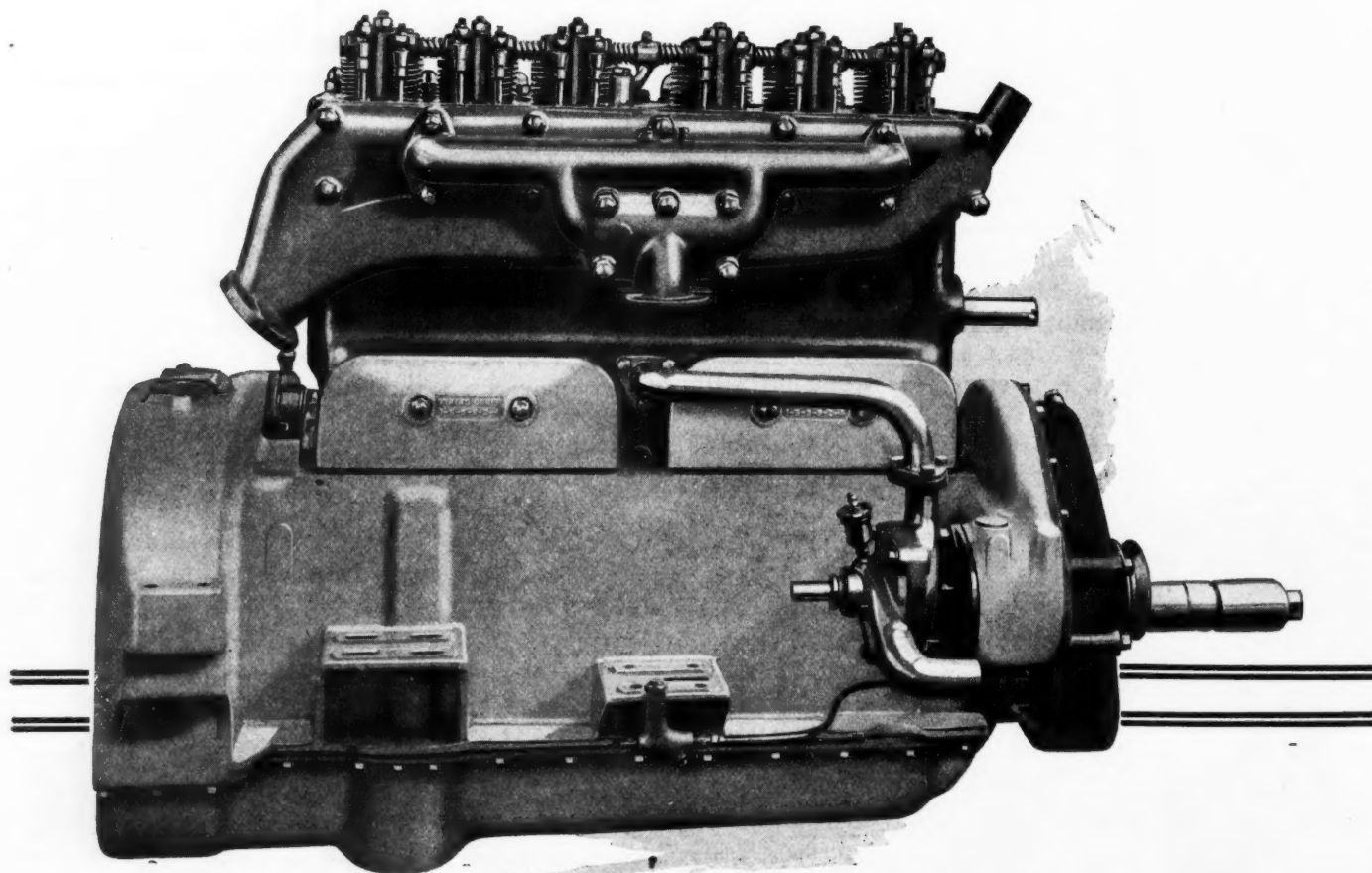
The Beaver model C.L.  $3\frac{1}{2} \times 5\frac{1}{4}$  shown below is especially adapted to cars of 3500 pounds or over. It develops 60 hp. at 2000 r.p.m.

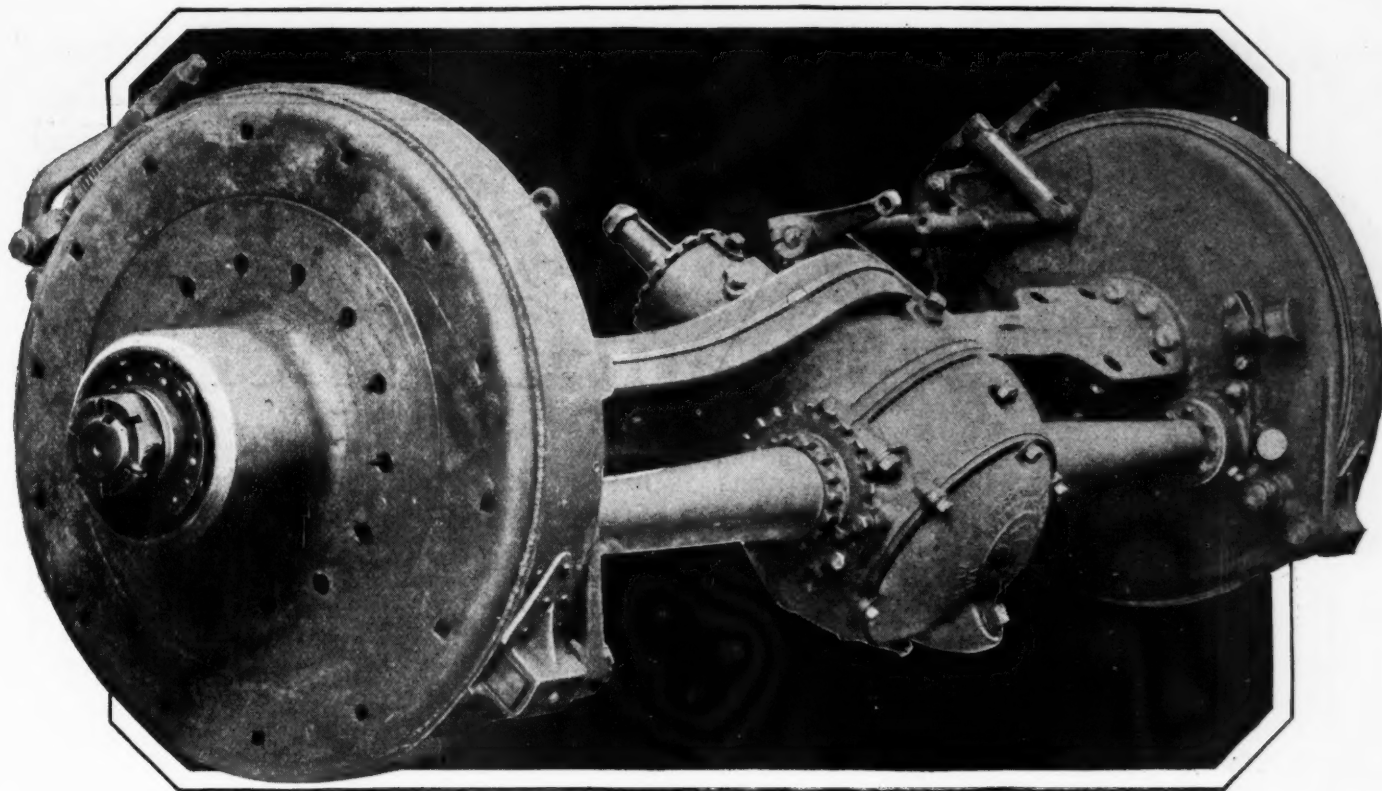
We shall be happy to send you detailed technical description.

**BEAVER MANUFACTURING CO.**

First and Oklahoma Avenues

Milwaukee, Wis.



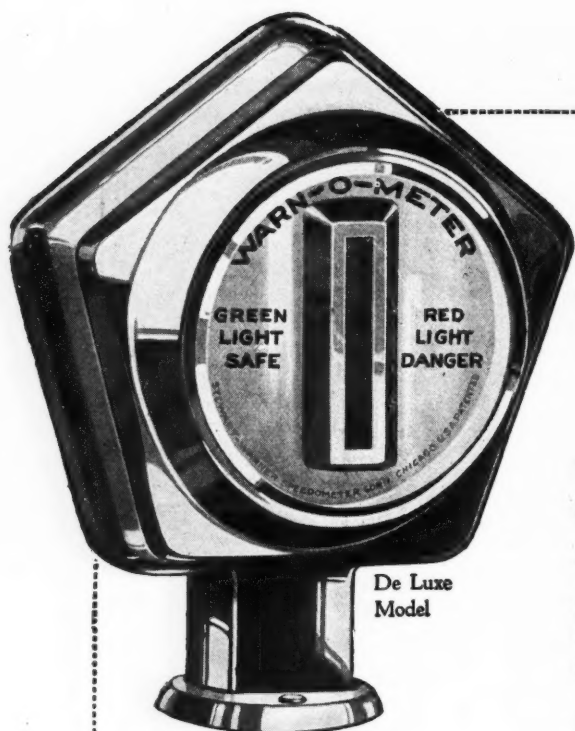


*Truck owners throughout America are proving, over and over again, that the Torbensen Axle improves truck performance, lengthens truck life, and lowers truck costs. By making the final gear reductions at the wheels, the Torbensen Axle increases driving power, and thus lightens the load on the motor. It is the lightest weight, yet the strongest axle for a given capacity. This means an important saving in the dead weight that must be carried beneath the springs, and makes for longer truck life, and greater tire mileage.*

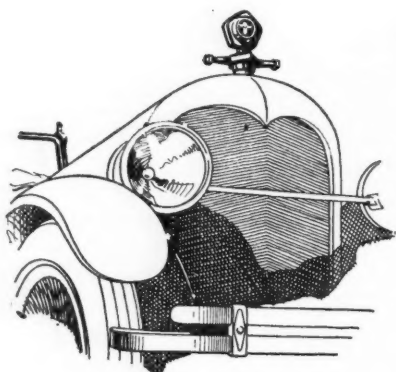
# TORBENSEN AXLES

CLEVELAND, OHIO





The Stewart Warn-O-Meter  
"It Warns in Time"



Installed on  
Radiator



Special Monogram  
Design in side  
Facing On-coming  
Cars

## The Warn-O-Meter

**Warns of an overheating motor. Operated directly from motor.**

The Warn-O-Meter can be installed on radiator, fender or hood. It is not a mercurial device. Has nothing to do with the water in radiator. Is not directly effected by weather conditions.

It warns the driver when the motor's heat is nearing a danger point. In order to do this accurately it is operated *directly from the motor*.

When the motor is cold no light shows in the Warn-O-Meter. At normal, efficient temperature a green light appears. If the motor begins to overheat the green gradually changes to a brilliant red.

Overheating will do serious damage to a motor if not checked. The Warn-O-Meter will save the motorist many repair bills.

It is not only practical but very attractive. In the side of the instrument, facing oncoming cars, there is a colored design which may be replaced if desired by a car nameplate, trade-mark, owner's monogram, etc. Illuminated by the light within the Warn-O-Meter.

The De Luxe Model, beautifully finished in nickel—\$12.50.

The Standard Model, with standard finish of black enamel and nickel,—\$10.00.

The Ford Model, given standard finish and furnished complete with radiator cap—\$10.00.

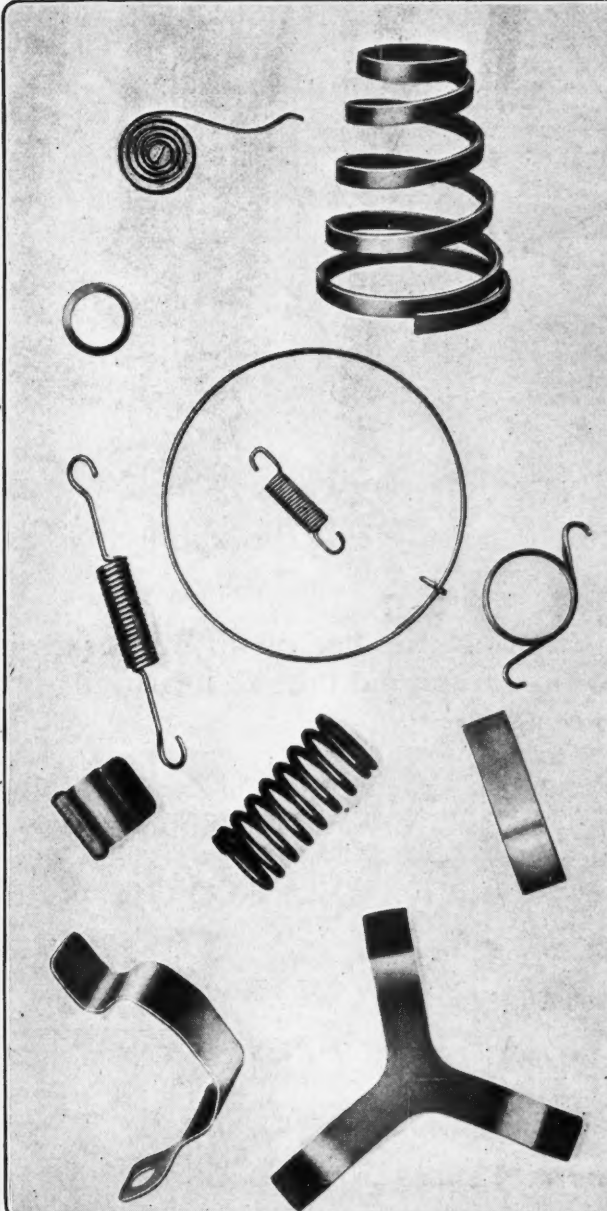
Write for free attractive booklet giving complete information on operation.

**Stewart-Warner  
Speedometer Corporation  
CHICAGO, U. S. A.**

16 years' experience in car accessory building.  
86 Service Stations all over the world.

**Meet Us at Booth C 99 (THIRD FLOOR)**

22nd NEW YORK AUTOMOBILE SHOW,  
Grand Central Palace, January 7th-14th, 1922



**A**T the Auto Show you are naturally watching keenly for possible new refinements in important operating parts and manufacturing methods. Some of these will very probably concern that indispensable part of every car or accessory—Springs.

Best results will follow if you'll talk them over while they're still fresh in mind with Wallace Barnes Company representatives, who will be at the show the entire week, ready to render any service or information.

Booth C99, third floor, is Barnes' Spring Headquarters, at the Grand Central Palace, January 7th to the 14th. Let us make you welcome.

**The Wallace Barnes Company***"Spring Makers for Three Generations"***Main Office and Works—Bristol, Conn.**

Spring Steel Rolling Mills: Forestville, Conn.

Western Office: Book Bldg., Detroit



EVERY dealer should be interested in supplying seasonable oil to his customer.

Winter motoring demands the use of an oil possessing a very low cold test—else much damage to bearings and cylinder walls is sure to result.

SUPREME AUTO OIL—*Flows Freely at Zero*—starts with the engine—lubricates thoroughly and continuously.

The dealer who stocks SUPREME AUTO OIL is sure of a steady flow of customers.

For particulars address our nearest office.

## GULF REFINING COMPANY

General Sales Offices: Pittsburgh, Pa.

### DISTRICT SALES OFFICES:

New York  
Atlanta

Philadelphia  
New Orleans

Boston  
Houston

*flows freely at zero.*



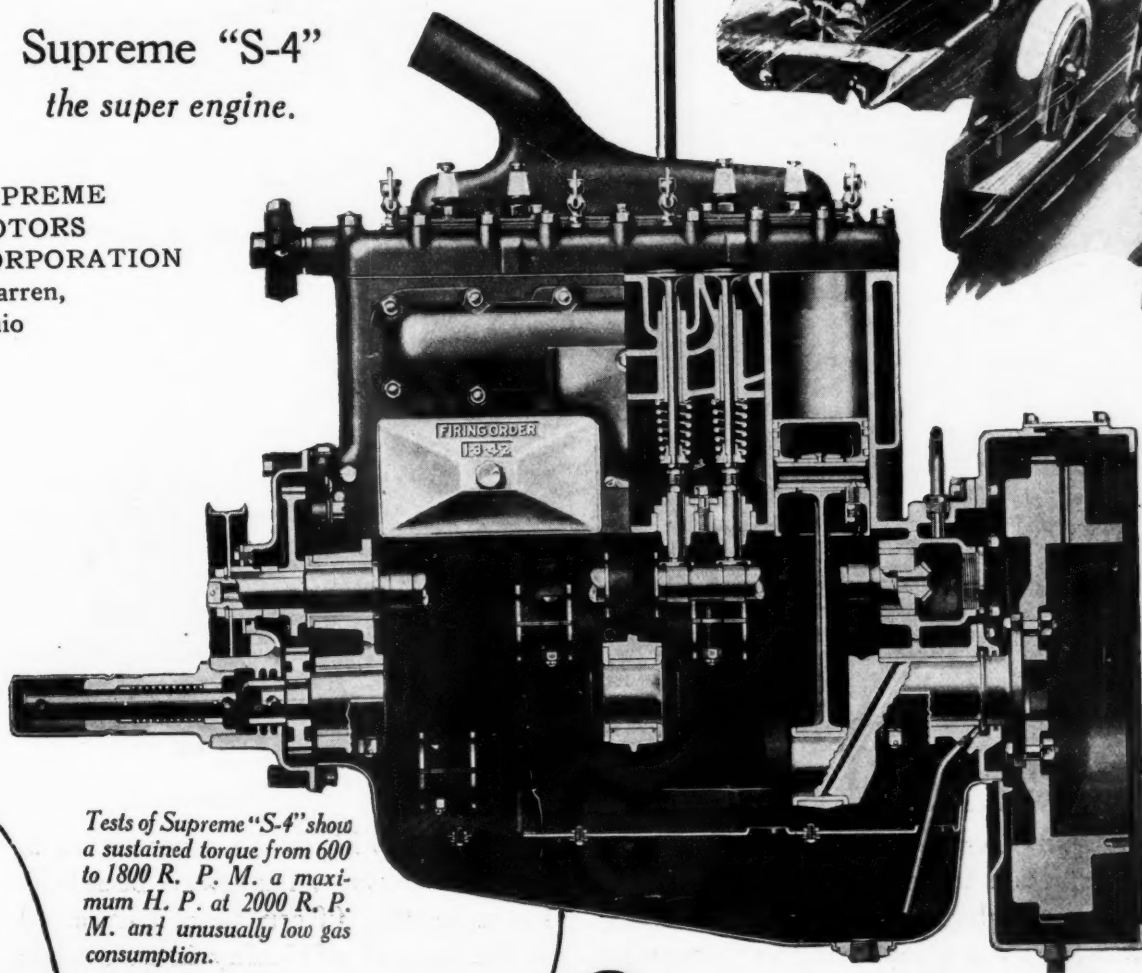
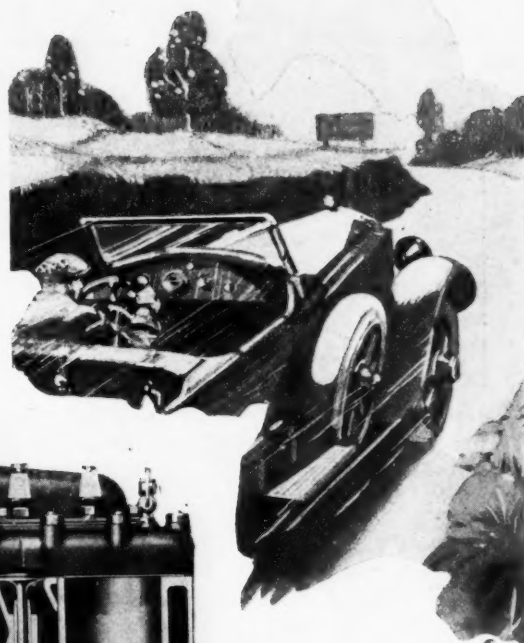


# Supreme

FOR light cars and speed trucks no other power plant—ever produced—so completely meets the needs as the

Supreme "S-4"  
*the super engine.*

SUPREME  
MOTORS  
CORPORATION  
Warren,  
Ohio

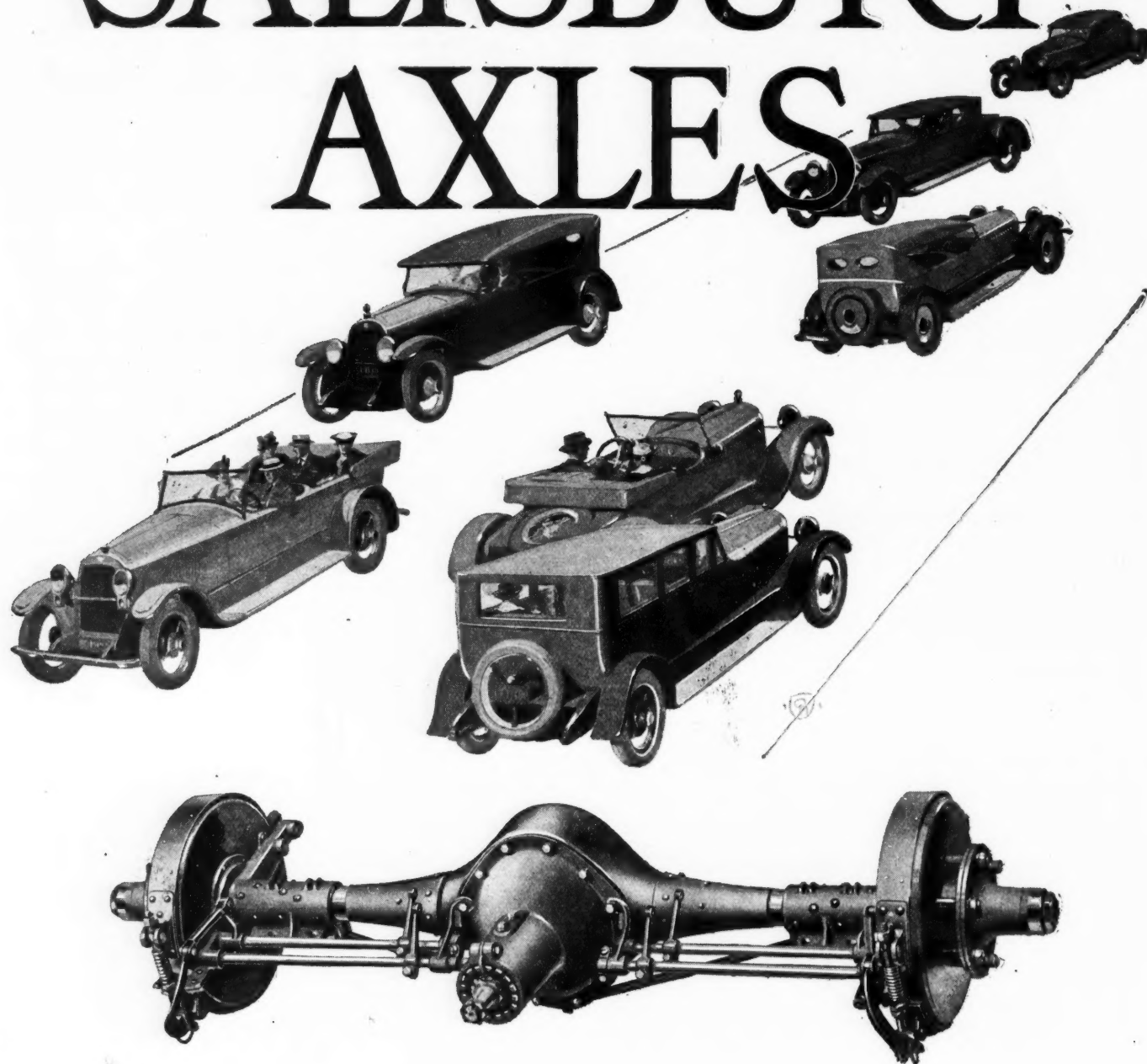


Tests of Supreme "S-4" show a sustained torque from 600 to 1800 R. P. M. a maximum H. P. at 2000 R. P. M. and unusually low gas consumption.

# Engines

PEAK OF POWER

# SALISBURY AXLES

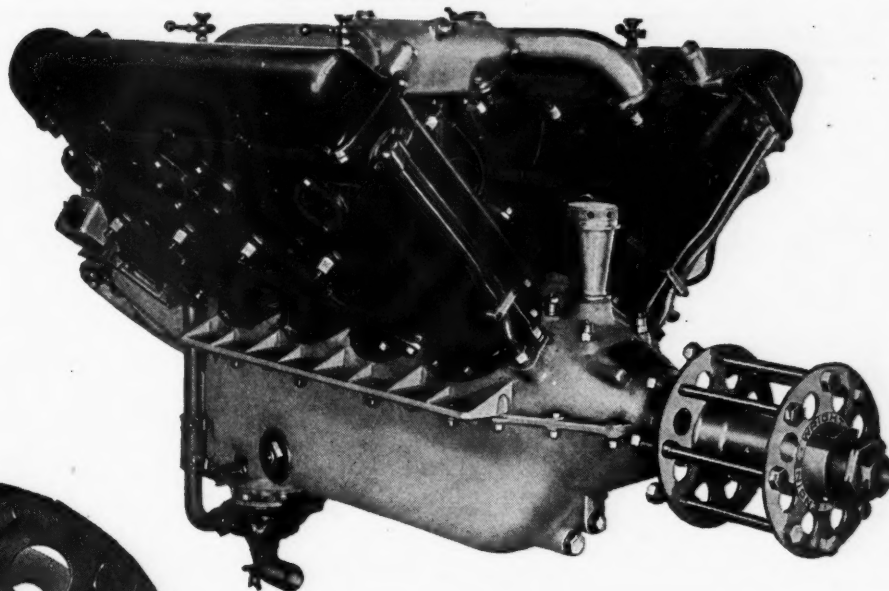


Salisbury Axles are making a genuine contribution to the satisfaction of motorists through the trustworthy service which they are rendering in thousands of American Motor cars. By their uniform dependability they are proving their worth not only to the makers of automobiles but to the motoring public as well.

We prize very highly the respect in which the name Salisbury has always been held. For more than fifteen years it has stood as the symbol of Quality in automobile axles—the symbol of an institution, the integrity and good standing of which have never been questioned. Salisbury is a name on which you can absolutely rely.

---

SALISBURY AXLE COMPANY, JAMESTOWN, N. Y., U. S. A.



*The identification of  
Incomparable Service*

FROM now on all WRIGHT engines will have this nameplate on the hub. This is a visible guarantee to all who fly with the engine that it was made by us in our own plant. This plate certifies that every ounce of material was critically examined, then machined by our own experienced men to exact gauge and carefully assembled. The nameplate guarantees the engine has passed our exacting running test requirements. While we are building aircraft engines this vigilance will never be relaxed.

*The seven absolute requirements for aircraft engines are fulfilled in the two models of Wright engines now in production and being sold.*

## ENGINE REQUIREMENTS

## RESULT IN PLANE OPERATION

- |                             |   |
|-----------------------------|---|
| 1. Lightness per horsepower | Greater useful load, increased performance.   |
| 2. High power               | Speed, climb, power reserve.  |
| 3. Low fuel consumption     | Economy, long travel radius, increased useful load.   |
| 4. Short overall length     | Increased manoeuvrability, compact installation.  |
| 5. Interchangeable parts    | No long repair periods, economy, safety.  |
| 6. Longevity                | Many WRIGHT engines built four years ago are still flying. Many have flown 1,000 hours and over. With the E-2 and H-2 engines incorporating changes based on actual experience from hundreds of our own engines, we advise commercial flyers to figure on ultimate life of 2,000 hours. |
| 7. Reliability              | The reliable WRIGHT engines safeguard the life of the flyers thru exacting quality and test requirements. Skill, experience and unrelaxing vigilance make these engines the most reliable in the world.   |

*Compare the characteristics of these stock engines now in production with any engine built—foreign or domestic.*

	WRIGHT E-2	WRIGHT H-2
Power at 2000 R. P. M.	220 H. P.	358 H. P.
" " 1800 "	200 H. P.	326 H. P.
Weight, dry with hub	485 lbs.	620 lbs.
Gas per H. P. hour	.48 lbs.	.5 lbs.
Overall length, including hub and mag.	4'-1 1/8"	4'-3 23/32"

NOTE:—The power given is the mean rated power, many individual engines give higher power and lower consumption.

Member Manufacturers'  
Aircraft Association



WRIGHT AERONAUTICAL CORPORATION  
PATERSON, N. J.

# WRIGHT

## AERONAUTICAL ENGINES

STANDARD MOTIVE POWER FOR ALL AIRCRAFT



**FORGINGS**  
**AND**  
**CASTINGS**  
**OF**  
**VANADIUM**  
(The Master Alloy)  
**STEEL**

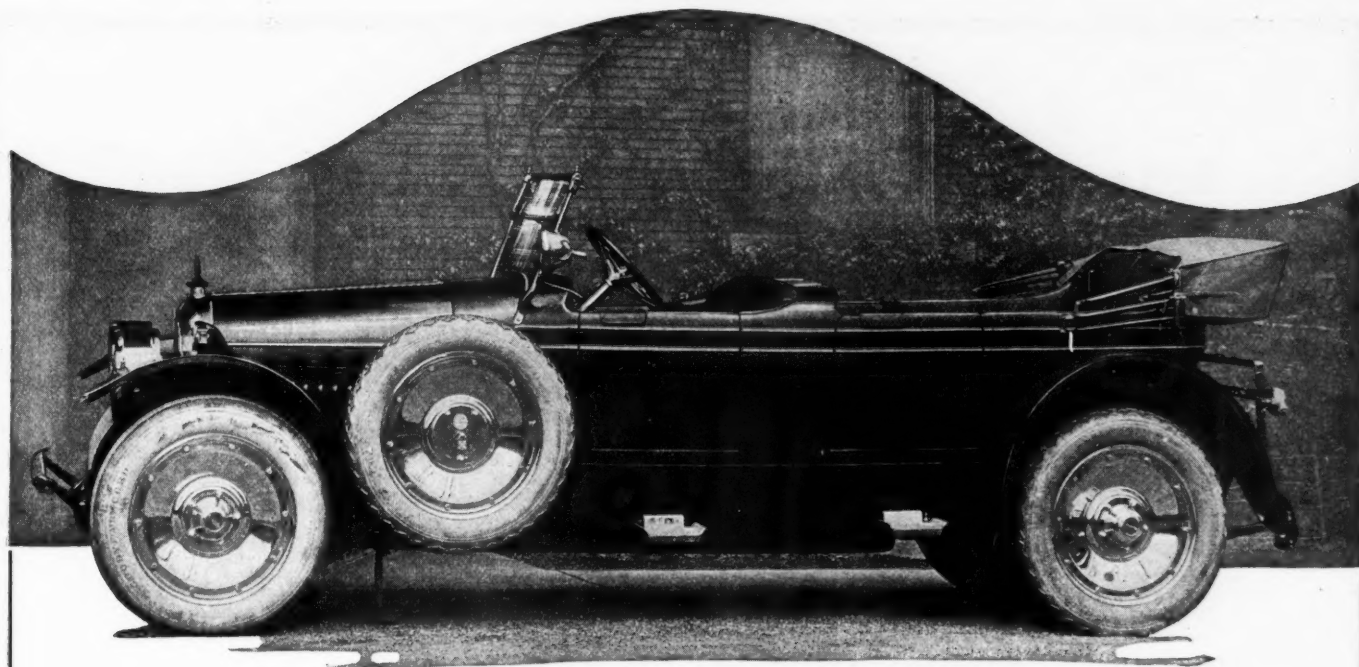
**HAVE**  
**UNSURPASSED**  
**STRENGTH**  
**TOUGHNESS**  
**RESISTANCE TO SHOCK AND FATIGUE**

*Let our Metallurgical Department help you solve your steel problems*

**VANADIUM CORPORATION OF AMERICA**

**120 BROADWAY**

**NEW YORK**



*Yes, it's on the "Cunningham"*

The Cuno Cigar Lighter is ever increasing in popularity with motorists who smoke, and as seven out of ten car owners do smoke, car manufacturers recognize the value of this convenient accessory, and are using it on the 1922 models.

It is easy to install.  
Automatic action.  
Always works.

Get back of a Cuno

*Write for Book of Cuno Products to*

**THE CUNO ENGINEERING CORPORATION**

*Makers of High Grade Automotive Equipment*

Meriden

Connecticut



Auto Cigar  
Lighter

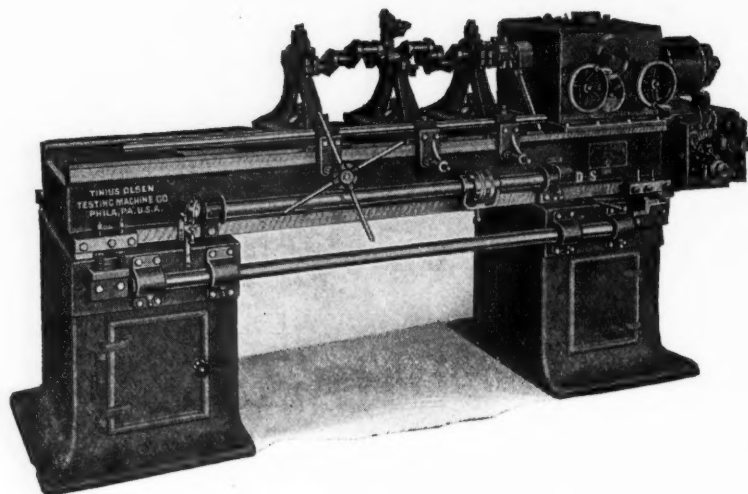


For Dash

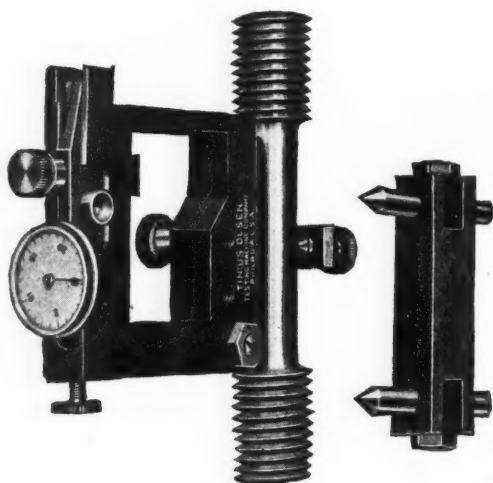


Smoking Set with  
ash receiver

**Eliminate Vibration**  
**Secure Perfect Balance With Speed and Economy**  
 USE THE  
**Olsen-Carwen Static-Dynamic Balancing Machine**



The last word in balancing is expressed in the Olsen-Carwen as it is the precision machine for balancing all rotating parts with the greatest of accuracy and reliability and at the same time on a production basis; the cost of balancing, once you have an Olsen-Carwen is only a few cents per part on a production basis, so the actual cost of balancing per part is negligible, while the value received from such a correct balance can hardly be computed as the entire success of your motor or car is dependent on it and thus the good will of the user at large.



**Olsen Testing  
Machines**

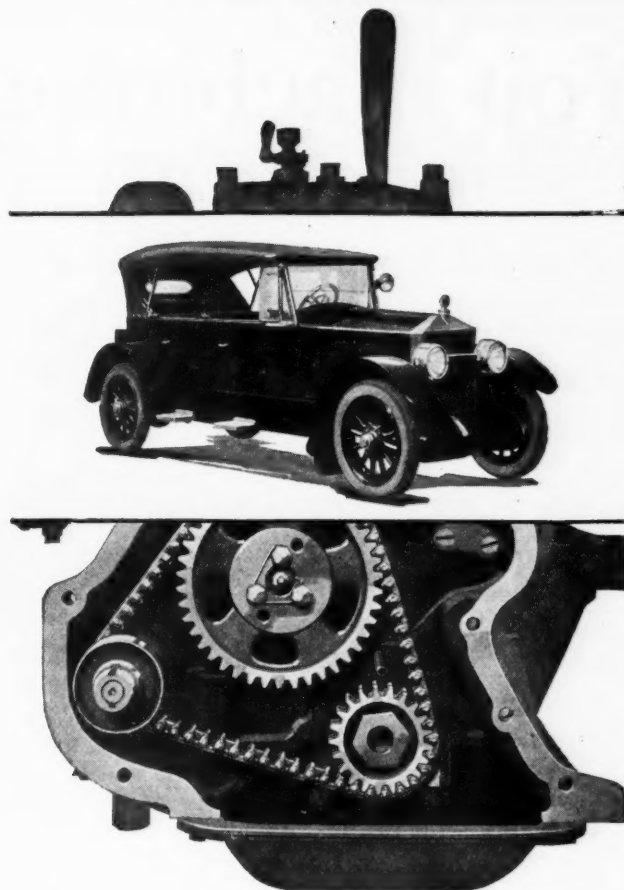
Have you seen the Olsen Special Strain Gage? It is the last word in an instrument for determining the fiber stress in any member? How about your chassis designs? Have you correctly proportioned web and flange sections? This instrument will show you just where you stand by indicating the fiber stress in these elements.

Manufactured by

**TINIUS OLSEN TESTING MACHINE COMPANY**  
 500 NORTH 12TH STREET PHILADELPHIA, PA., U. S. A.

Foreign Representatives: Edward G. Herbert, Ltd., Manchester, England; Andrews & George Company, Tokyo, Japan; Messrs. R. S. Stokvis & Fils, Paris, France; Brussels, Belgium; Rotterdam and Amsterdam, Holland.





*The Ambassador*, for those fully able to appreciate the intimate details of refinement and mechanical achievement.

Built by the Yellow Cab Company, whose engineers are keen to observe better performance and realize advancement in such details as produce lasting quality and trouble-free operation, the Ambassador includes only tested and proved equipment.

Genuine Morse Chain for driving the cam and accessory shafts was chosen because it offers the only real lasting solution for its important function. It operates with sustained quietness and efficiency.

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MORSE CHAIN COMPANY  
Main Office and Works    Sales and Engineering Office  
ITHACA, NEW YORK    DETROIT, MICHIGAN

# MORSE

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GENUINE      SILENT      CHAINS

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# ARE You machining from solid stock when you could stamp or draw to size more economically?

Lots of folks who have done this in the past are now using metal stampings made on "BLISS" Presses.

We do *not* make stampings but we can tell you who does and—better still—we can give you the names of just the firms best fitted by experience and equipment to do exactly the thing you need.

**Ask us—but don't forget to include a sketch and description of the article or parts**



1857  
LONDON

## E. W. BLISS COMPANY

Main Offices: BROOKLYN, N. Y., U. S. A.  
American Factories: BROOKLYN, N. Y., and HASTINGS, MICH.



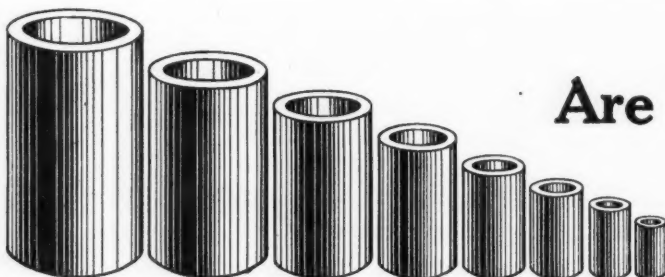
1921  
ST. OVEN

### SALES OFFICES

CHICAGO, People's Gas Bldg. DETROIT, Dime Bank Bldg. CLEVELAND, Union Bank Bldg.  
CINCINNATI, Union Trust Bldg. BUFFALO, Marine Bank Bldg. ST. LOUIS, Boatmen's Bank Bldg.  
PITTSBURGH, Keenan Bldg. NEW HAVEN, Second Nat'l Bank Bldg.

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in a plan by which you can cut your cost on Bronze Bushings, have ample stocks with a heavy inventory, get the goods the instant you want them, however suddenly the need arises? If so, let us tell you about Stock List "Y".

## Bronze Bushings and Bearings, Babbitt-lined Bearings

Cored Bronze Bars in 16 stock sizes. A big factory and five branches always at your service. Write, 'phone or call.

## THE BUNTING BRASS & BRONZE CO.

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## G & E Gear Hobbing Machines

can be adapted for automatically generating single or multiple thread worms by a new hobbing process recently developed by us.

The rate of production is considerably greater than that attained by any other method; at the same time, a higher degree of accuracy is assured in the finished worms.

You will be well repaid for investigating this improved worm hobbing process.

Submit your blue prints for an accurate analysis of costs.



### DOMESTIC AGENTS:

Moore & Merryweather Machinery Co., Cleveland, Pittsburgh, Detroit and Cincinnati; Henry Prentiss & Co., New York, Boston, Buffalo, Syracuse, Rochester, and Hartford, Conn.; Marshall & Huschart Machinery Co., Chicago, Ill.; Marshall & Huschart Machinery Co. of Indiana, Indianapolis, Indiana; Dewstoe Machine Tool Co., Birmingham, Alabama; Eccles & Smith Co., Los Angeles, San Francisco,

and Portland, Oregon; Elliott & Stephens Machinery Co., St. Louis, Mo.; Hallidie Machinery Co., Seattle, Wash.; Kemp Machinery Co., Baltimore, Md.; Robinson, Cary & Sands Co., St. Paul, Duluth, Minn.; Salt Lake Hardware Co., Salt Lake City, Utah; Seeger Machine Tool Co., Atlanta, Ga.; W. E. Shipley Machinery Co., Philadelphia, Penna.; Oliver H. Van Horn Co., Inc., New Orleans, La.

### CANADIAN AGENTS:

A. R. Williams Machinery Co.—St. John, Winnipeg, Montreal, and Halifax. F. F. Barber Machinery Co.—Toronto and Hamilton.

# DROP FORGINGS STILLSON WRENCHES TOOL KIT EQUIPMENT

Our equipment of over one hundred hammers and two complete plants enables us to take care of unlimited production.

Moore forgings are furnished to specifications which means the greatest possible machine shop economy.

We specialize in heat treating where desired.



MOORE DROP FORGING COMPANY  
SPRINGFIELD, MASS. U.S.A.



## "Quotations"

There is no assurance of satisfaction or economy in quotations—regardless of how appealing they may be.

Materials and workmanship, and not attractive prices should guide the discriminating purchasing executive, for his activities are as important to the finished product as those of the engineers and production officials.

Close adherence to self-imposed standards seldom encountered in parts of this kind, has resulted in the growth of the Hoover plant to a point where it now supplies the largest number of balls purchased by the industries of the United States.



### HOOVER STEEL BALL CO. ANN ARBOR, MICHIGAN

Manufacturers of:  
STEEL—BRASS—BRONZE—MONEL  
ALUMINUM—HOLLOW BALLS

#### BRANCHES

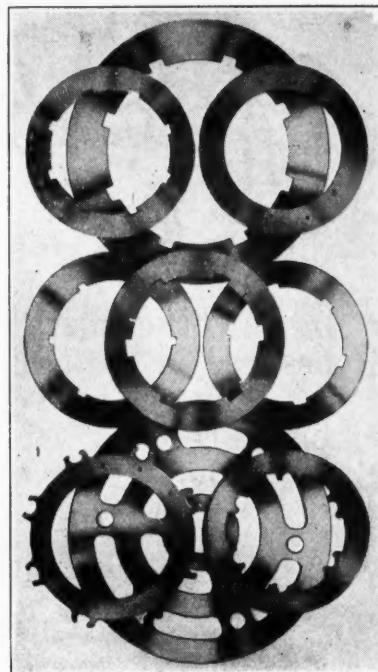
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Philadelphia.....259 Middle City Bldg.  
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### ATKINS CLUTCH PLATES

Our facilities for manufacturing "Silver Steel Saws" enable us to make Hand Hammered Clutch Plates and Discs, superior to all others.

Furnished, plain or slotted, unfinished or ground and polished, tempered or untempered, any size.

Get our prices before you buy.

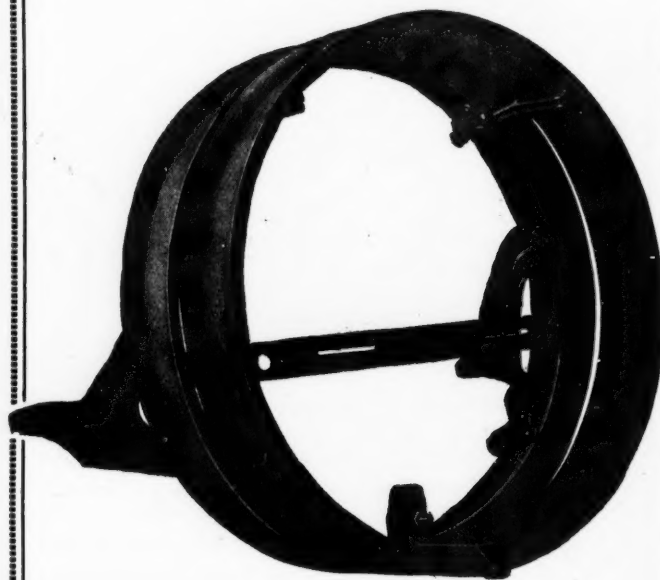


"A Perfect Plate for Every Purpose"

**E. C. ATKINS & COMPANY**

Established 1857. "The Silver Steel Saw People."  
Indianapolis, Indiana

### DETROIT TIRE CARRIER



**DETROIT CARRIER & MFG. CO.**

DETROIT, U. S. A.

# Specify— LEATHER

**M**ANY new effects in the *present day economical* leather upholstery will be displayed at both automobile shows.

Striking effects—obtainable only in leather—interesting now because leather is relatively the cheapest basic commodity in the country.

But price alone never dominates leather's specifications—car owners want it, that's all.

They like the feel of leather—its soft-

**It costs no more than other upholsteries — preferred by all**

ness—its never-changing elegant appearance. Keeps clothes clean—is odorless—scuff and peel proof, of course.

Get the facts about leather upholstery's economy at our booth on the **FOURTH FLOOR** of the **GRAND CENTRAL PALACE** at **NEW YORK** and the **BASEMENT** of the **COLISEUM** at **Chicago**—see the display.

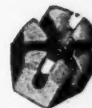
**TANNERS' COUNCIL**  
at Park Row, New York City

THERE IS NOTHING LIKE LEATHER; THERE NEVER HAS BEEN AND PROBABLY NEVER WILL BE



**"You Can Always Rely on EMPIRE Bolts and Nuts"**

There is nothing speculative about the quality of Empire Bolts and Nuts. Their staunch virtues have become a world wide tradition, through 76 years of service in every conceivable line of industry.]



**RUSSELL, BURDSALL & WARD**  
**BOLT & NUT COMPANY**

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CHICAGO - SAN FRANCISCO

ROCK FALLS, ILL.

Makers of Bolts, Nuts and Rivets Since 1845



## NOISELESS TIMING GEARS

Most timing gears are made of metal. Metal gears are noisy. Some motor car makers use chains. Chains stretch and rattle. But *you can have silent timing gears*—waterproof, vulcanized fibre gears that will serve you better than metal gears or chains.

## CONDENSITE CELORON

Silent Timing Gears

replace noisy gears and rattling chains with silent performance. These gears mesh without noise because they are non-metallic. They eliminate the grind or rattle of metal upon metal. They cushion the shock of gear upon gear and help lengthen the life of every part of your engine. They never crystallize and always give service because they are highly resilient—able to absorb sudden shock or strain.

In short, Condensite Celoron timing gears are both trouble and fool-proof. Request them on your next car, or have them installed now on your present one. Ask your local car dealer or any authorized service station. If they can't help you write us direct.



### Diamond State Fibre Company

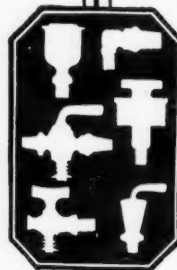
Bridgeport (near Philadelphia), Pa.

Branch Factory and Warehouse, Chicago.

Offices in Principal Cities

In Canada:

Diamond State Fibre Co. of Canada, Ltd., Toronto.



## LUNKENHEIMER

### Automotive Accessories

"Standard Equipment" on high grade Automotive Power Units because of their in-built quality and the exceptional service which they give.

The extreme durability of Lunkenheimer Automotive Accessories is a contributing factor to safety and reliability in operation.

"Lunkenheimer-equipped" is a criterion for "Quality" and is universally acknowledged by builder and user as a prime requisite for continuity of operation and economy in maintenance.

Distributors of Lunkenheimer Products situated in every commercial center.

### THE LUNKENHEIMER CO.

"QUALITY"

LARGEST MANUFACTURERS OF  
HIGH GRADE ENGINEERING SPECIALTIES  
IN THE WORLD

NEW YORK  
CHICAGO

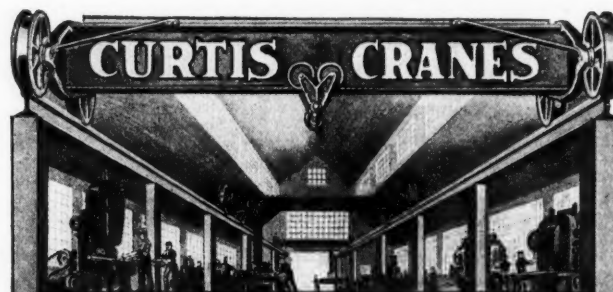
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WRITE FOR  
CATALOG  
No 5

29-86A-80



## CURTIS CRANES

### Light, Safe and Easy to Move

Curtis I-Beam Cranes are preferred in many leading industrial plants for their safety and ease of operation. They are quickly erected at small cost.

Equipped with Flexible Roller Bearings throughout. Made in various types, hand and pneumatic, in capacities up to 20,000 pounds and in spans up to 40 feet. All parts are extra strong, without excess weight.

Write for illustrated  
descriptive literature

### CURTIS PNEUMATIC MACHINERY CO.

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St. Louis, U. S. A.

Branch Office:

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Canadian Representative, Joseph St. Mars, 706-F  
Sterling Bank Bldg., Winnipeg, Can.



The Original  
Robert Bosch

# QUALITY PRODUCTS

*Insist on the trade mark*



**ROBERT BOSCH  
MAGNETO COMPANY**

INC.

OTTO HEINS, *President*

123 West 64th Street, New York, N. Y.

*Write for Name of Nearest Dealer*

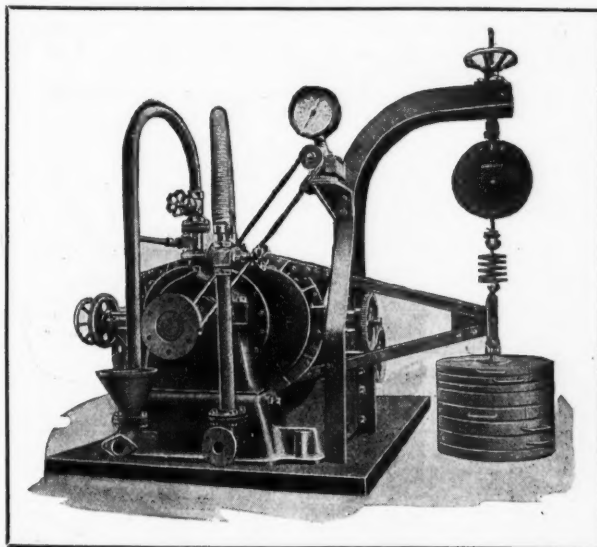
INVESTIGATE

**FROUDE**

Hydraulic Absorption

**DYNAMOMETERS**

FOR ACCURACY AND COST

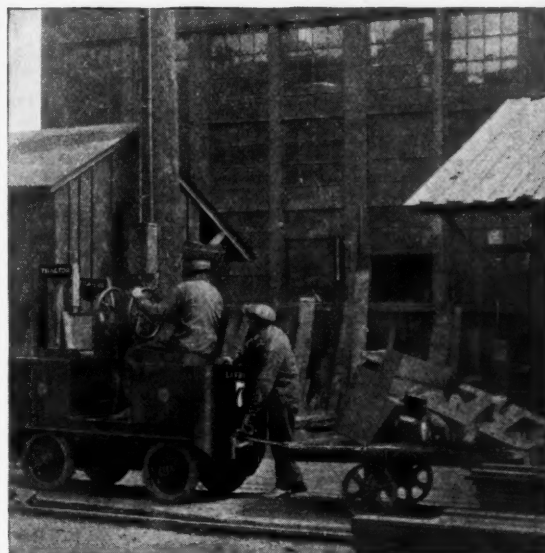


We build Froude Dynamometers in special types and sizes for gas engine and chassis testing.

Inquiries are solicited.

Write for illustrated bulletin F-70.

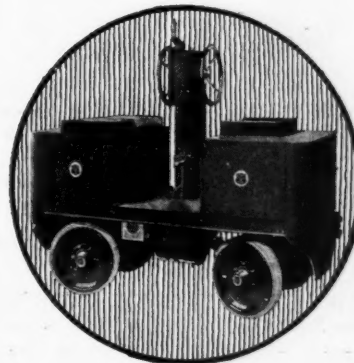
**C. H. WHEELER MFG. CO.**  
PHILADELPHIA, PA.



## \$8500 per Year Saved with Tractors and Trailers

At the plant of the Bucyrus Co., South Milwaukee, Wis., 5 men, with Lakewood tractors and trailers, handle 50 tons a day of raw and semi-finished material through the plant, at a saving in labor cost of \$8500 per year. Fourteen men were formerly required for this same work.

Similar savings in production costs are possible wherever heavy loads are moved by hand. Tell us your problem, we may be able to suggest the answer.



**The Lakewood Engineering Company,**  
Cleveland U.S.A.

LAKEWOOD METHODS AND MACHINES

**VUL-COT Fibre****For All Insulation  
Vul-Cot Fibre***Machines as readily  
as lead*

VUL-COT Fibre comes in sheets, rods and tubes. It's dense and tough and has an extremely low friction co-efficient. This gives it the greatest wear resistance of any insulator.



VUL-COT Fibre is always uniform—never contains fissures, hard or soft spots, grit or other foreign matter. Edge tools used in machining it are subjected to little wear. Here are the physical properties of VUL-COT Fibre:



Tensile strength, 9,000 to 14,000 pounds per square inch—compressive strength, 32,000 to 67,000 pounds per square inch—Resistance to shearing, 9,000 to 13,000 pounds per square inch—Specific Gravity, 1.2 to 1.5. Electrical rupture, 100 to 400 volts per mil.



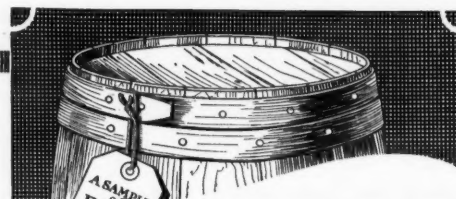
—And these are the properties that have made VUL-COT Fibre "The Material with a Million Uses." We have a book bearing this title. We'll send it: Tell us where. Also consult the VUL-COT Service Dept. in your individual problems.

**AMERICAN VULCANIZED FIBRE CO.**  
599 Equitable Building, Wilmington, Del.

**SALES OFFICES**  
BOSTON PHILADELPHIA CLEVELAND CHICAGO  
NEW YORK PITTSBURGH DETROIT ST. LOUIS

*Complete Stock for Immediate Shipment at Chicago*

Western Agents  
**Western Electric Company**  
SAN FRANCISCO SEATTLE  
PORTLAND OAKLAND  
Canadian Agents  
**Northern Electric Company**  
MONTREAL TORONTO WINNIPEG  
OTTAWA HALIFAX CALGARY  
REGINA VANCOUVER

**VUL-COT Fibre****ESCO****The Universal Cleaner**

*Is rapidly displacing the many cleaners that lack in one or more of the good qualities that are all found in this perfect compound. These qualities are positive action, speed of operation, long life, non-tarnishing, easy rinsing, safety to skin and clothing, economy.*

**MAKE THE TEST**

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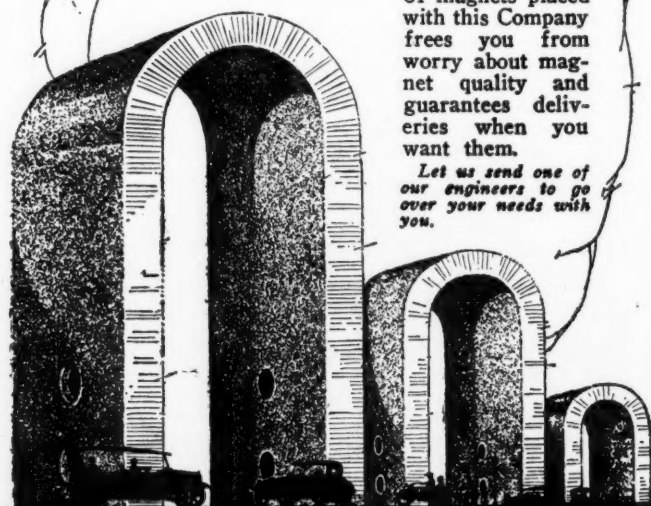
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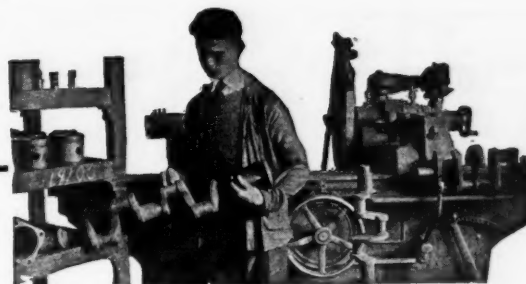
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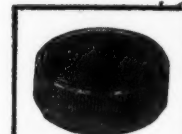
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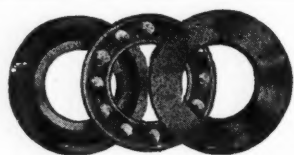


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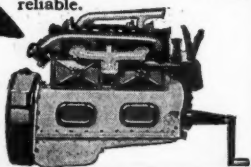
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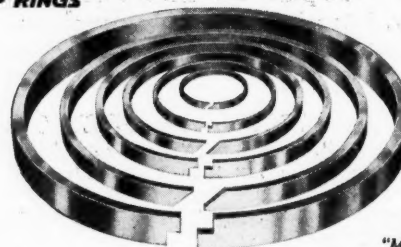
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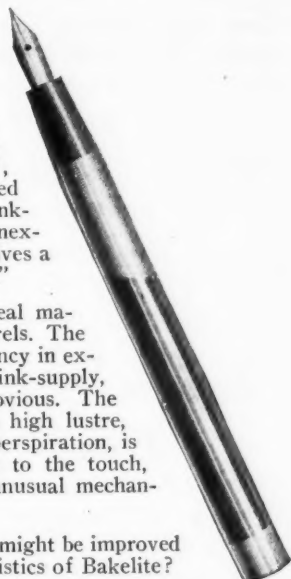
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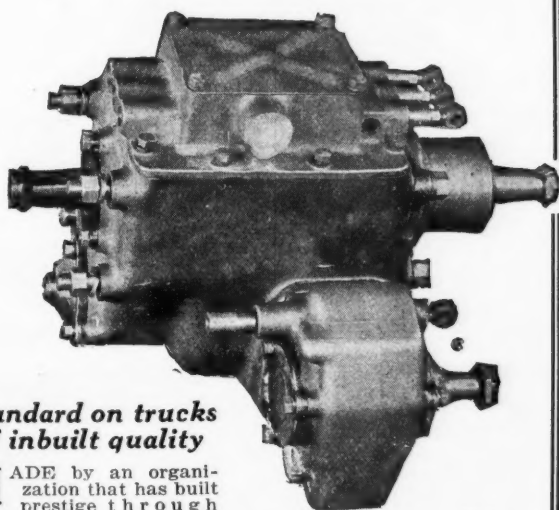
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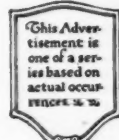
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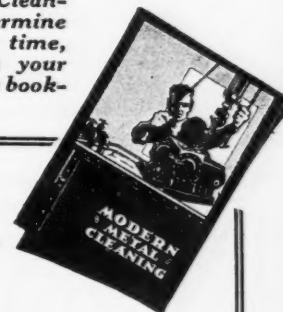
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So every effort was made by a large metal working plant to find a cleaner that would do the work even with the fair satisfaction given by kerosene. Many cleaners were tried, but no success was had.

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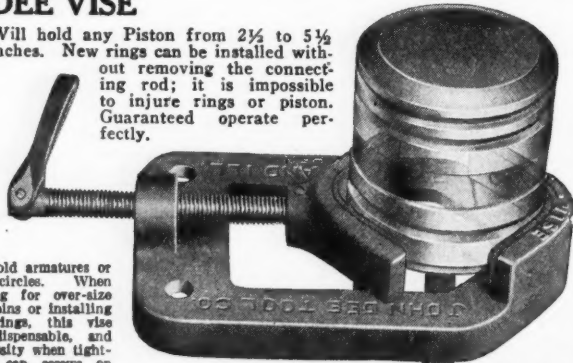
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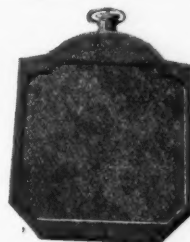
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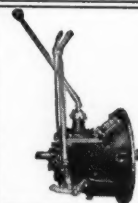
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**BALL BEARINGS**  
**ARE UNEXCELLED****THE FAFNIR**  
**BEARING COMPANY**  
CONRAD PATENT LICENSE  
NEW BRITAIN, CONN. U.S.A.  
DETROIT CHICAGO**"NATIONAL" THRUST BEARINGS**  
**SELF LUBRICATING**The very best for Clutch, Throw-  
out and Differential**NATIONAL BEARINGS COMPANY**  
Lancaster, Penn.**EMPRESS**  
**High Pressure Lubricating System**  
FOR ALL MOTOR CARS AND TRUCKS  
**BOWEN PRODUCTS CORPORATION**  
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Finished Steel Products

Cold Drawn Steel, Shafting, Free Cutting Screw Stock, Rounds, Hexagons, Squares, Flats, Special Shapes, Finished Machine Keys, Standard Woodruff Keys, Flattened, Ground and Polished Steel Plates, Discs, Foundry Pattern Plates, Steel Core Plates.

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Beaver Falls, Pa. New York Office, Woolworth Bldg.

For further information on Barnes Piston Blanks, see our full-page advertisement in January 5th issue of Automotive Industries

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Felts for all purposes used in connection with axles, transmissions, universal joints and all working parts. Felt Washers, Wicks, Packings.

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Plant occupies twenty-three acres

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**ROME QUALITY** Sheets, tubes, rods, strips, shapes.**BRASS ROME COPPER**

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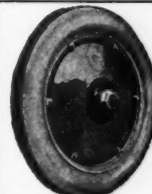
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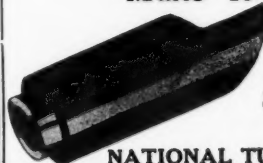
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Largest Variety of Hot and Cold Molded Insulation in the Industry

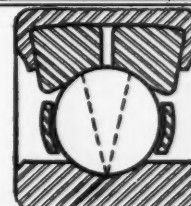
Specialty Insulation Mfg. Co., Inc., Hoosick Fall, N. Y.

N. Y. Office, 347 Fifth Ave.  
Chicago, 36 N. Dearborn. Pittsburgh, 600 Chamber Commerce Bldg.

Make It of "Seamless"

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Ask for "SHELBY" Booklet No. 103.

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**BROWN-LIFE-CHAPIN DIFFERENTIALS**

Both at Syracuse, N.Y.

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LATEST PRODUCTION EQUIPMENT FOR FABRICATION OF

**Parts or Complete Units, Aeroplane Parts, Experimental Motors, Aeronautical or Automotive. Testing Equipment, General Machine Construction**

AND MANUFACTURE OF PARTS IN QUANTITIES

Automatic and hand screw machine capacity to  $4\frac{1}{4}$ " diam. Lathes to 36" swing. Bullard vertical and Lucas horizontal boring mills, vertical and horizontal millers, multiple high power and sensitive drills. Grinding, gear cutting, thread milling, gun drilling, broaching, stamping, heat-treating, pyrometer equipment, full testing equipment, also pattern and wood-working shop, sheet metal and forge shop. Engineering where desired.

Submit your mechanical problems to

**BREWSTER & CO., Inc.**

Bridge Plaza, LONG ISLAND CITY, N. Y.

LIGHT GRAY IRON AND SEMI STEEL

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The Fremont Foundry Co.  
FREMONT, OHIO.

HUB CAP AND SPARK PLUG  
WRENCHES; SPECIAL SOCKET AND  
FLAT WRENCHES; METAL STAMP-  
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NATICK, MASS.

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CAPACITY  $\frac{1}{4}$ " TO  $\frac{3}{4}$ "

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FITCHBURG, MASS.

## Let Us Assume Your Production Problem

We are prepared to undertake the manufacture of your products or machinery on a basis that will be distinctly profitable to you.

Lippincott-Carwen Corporation  
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## Light Steel Stampings, Pressed Steel Parts Light Drop Forgings

We are in position to accept some contract work at moderate prices. Reliable work, quick deliveries. Send us particulars of what you want made and let us quote.

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High Production Automatic Drilling  
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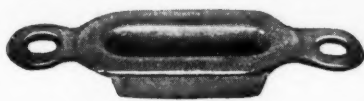
## GEAR CUTTING SPUR AND BEVEL GEARS

If you want an accurate, prompt and satisfactory job, try us. We specialize. Also equipped to do cylinder grinding and guarantee high class workmanship.

AUTO ENGINE WORKS  
ST. PAUL, MINNESOTA



## METAL STAMPINGS



Light and Quality To  
Heavy Stampings Order

Worcester Stamped Metal Company  
Worcester, Mass.

## PISTON PINS

Hardened and Ground Parts  
THE MACHINE SPECIALTY  
COMPANY

Ann Arbor Michigan

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made in all metals. Finishing Washers a Specialty.  
MASSACHUSETTS MACHINE SHOP, Inc.  
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## BRASS, BRONZE AND ALUMINUM CASTINGS

Designers and Manufacturers of Completely Finished Parts  
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**Keystone  
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HIGH-GRADE

**Jigs, Fixtures, Dies,  
Gauges and Special  
Machines**

Send for Free Illustrated  
Prospectus

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TOOL & DIE CO.**

ROSELLE, N. J.  
Established 1913

30 Minutes from New York City



## Machine Work Wanted

Especially for

LARGE AND SMALL GRINDING — CYLINDRI-  
PLANERS CAL AND SURFACE  
SLOTTERS BORING LONG HOLES  
BROACHING HEAT TREATING AND  
MILLING MACHINES MACHINE WORK  
GENERALLY

**Driggs Ordnance &  
Manufacturing Corp.**

Whitney Avenue & Audobon Street,  
NEW HAVEN, CONN.

## YOUR GROUND WORK

LET SPECIALISTS  
DO IT FOR YOU

PRECISION AND FINISH GUARANTEED

**A. B. LANDIS & SONS**  
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## MACHINE WORK

LIGHT, ACCURATE MACHINE WORK  
CONTRACT MANUFACTURING

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QUALITY AND SERVICE  
OUR

CHIEF ATTRACTION  
**FRANKLIN BROTHERS**  
CEDAR RAPIDS, IOWA

## MALLEABLE and SEMI-STEEL CASTINGS

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Foundry: Temple, Pa.

Office: Philadelphia, Pa.

# THE CLEARING HOUSE OF THE MOTOR INDUSTRY

*For Parts, Accessories, Tires, Machinery, Rebuilding, Repairing, Welding and Used Cars. Also Help  
and Situations Wanted and Miscellaneous Classified Advertising.*

## Situation Wanted

### Advertising Rate

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A full remittance must be sent with  
each order.

Body Engineer and Production Executive—Desires  
connection with a progressive company manufacturing  
bodies for the trade or automobile company building  
their own bodies. Broad experience, conversant in  
all phases of body business, open and closed, medium  
and high grade coach work, modern methods, any  
quantity production, any part of U. S. or Canada.  
Can meet the trade; some body sales experience.  
Constant and reliable. References exchanged. Ad-  
dress Box 143, c/o Automotive Industries.

## WANTED

Electric Absorption Dynamometer, Cradle Type 50/75 H.P.

Give full details relative to condition and price. Address Box 142, c/o Automotive Industries.

*Attorney-at-Law and Solicitor of Patents  
Formerly Member Examining Corps, United  
States Patent Office*

**C. L. PARKER**

American and foreign Patents secured. Searches made to  
determine patentability and validity. Patent suits con-  
ducted. Pamphlet of instructions sent upon request.  
McGill Building, WASHINGTON, D. C.

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**FOUR CYLINDER POPULAR  
PRICED CAR**

of beautiful and new design, using a standard engine.  
Will sell manufacturing rights, design and patterns for  
actual cost of producing the model car—ready for exhibi-  
tion at National Show. Address Box 138, c/o Automotive  
Industries.

## MANUFACTURERS LOOKING FOR HELP

Manufacturers looking for men of ability such as Engineers, Salesmen, Mechanics, etc., etc., will always  
find it to their advantage to use these columns. The Automotive Industries is read almost daily by the  
men who know and are accomplishing things daily. The men worth while will read your advertisement in  
this paper. Try it for results.

Investigate LATEST

**"WHITNEY"****HIGH EFFICIENCY**

ROLLER AND SILENT TYPE

**CHAINS**also *Low Cost per Thousand Miles of Service*Latest Roller Chains Have Special Quality Solid Rolls  
and Other Important Improvements**Front End Motor  
Chain Drives**

**EXCEPTIONAL  
MILEAGE  
AND  
NEVER KNOWN  
TO SKIP THE  
SPROCKET  
TEETH**



**THE WHITNEY MFG. CO.**  
HARTFORD, CONNECTICUT, U. S. A.

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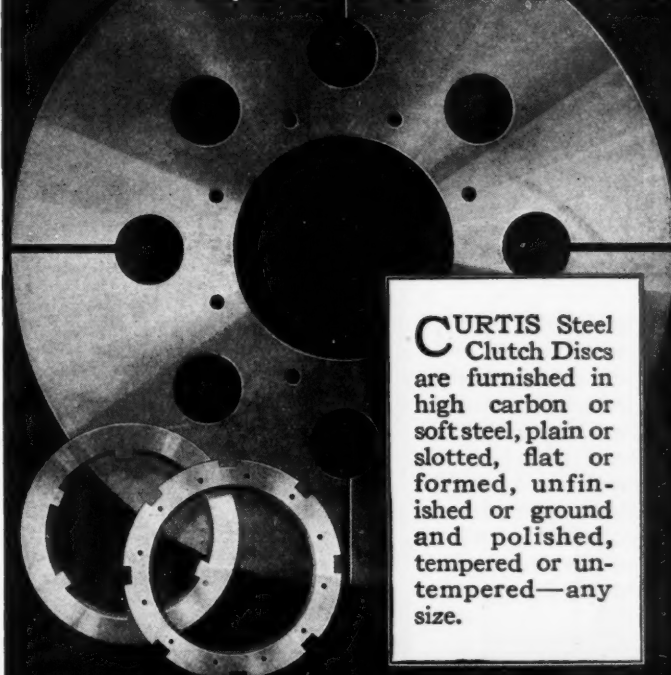
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CURTIS  
CLUTCH DISCS

**C**URTIS Steel Clutch Discs are furnished in high carbon or soft steel, plain or slotted, flat or formed, unfinished or ground and polished, tempered or untempered—any size.

**W**E are experts in the manufacture of custom-built clutch discs of precision. We know exactly what is necessary to satisfactory performance in automobile, truck or tractor service.

By concentrated effort and intensive skill we have over a period of years developed the clutch disc business to a plane not approached by any other manufacturer.

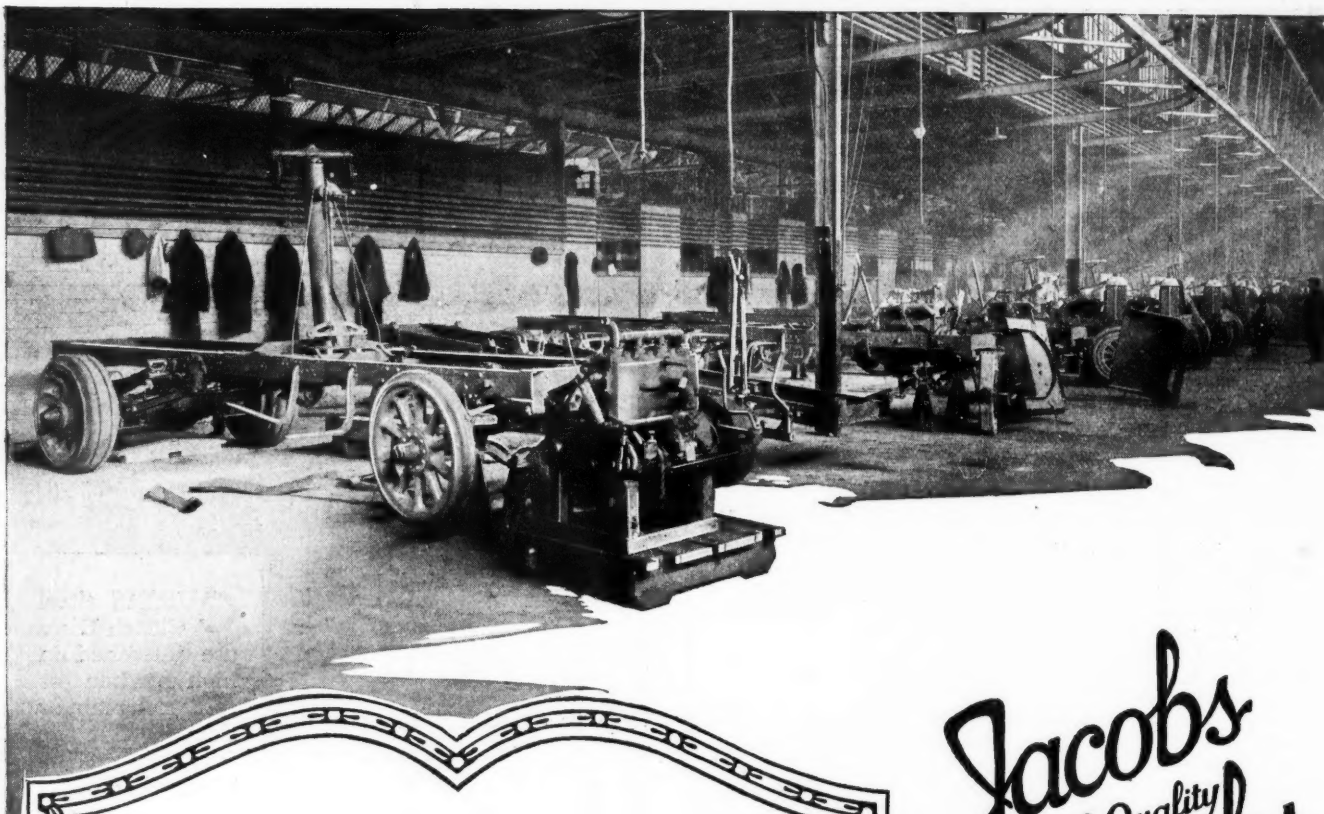
We have solved many perplexing problems. We are in a position to give expert advice as to your particular needs.

**Curtis Clutch Disc Co.**

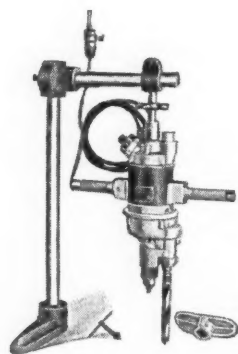
1649 Kienlen Ave. St. Louis, Mo.







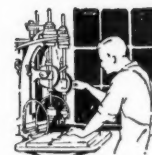
Portable Electric Tools built by The Stow Manufacturing Company, Inc., are of proven value—Built with forty years' experience.



THE STOW HEAVY-DUTY  
2-Speed, 2-Spindle Drill  
Built by  
The Stow Manufacturing Company, Inc.  
Binghamton, N. Y.  
U. S. A.

*Designed by* MACHINERY

*Jacobs*  
*Quality*  
*Chucks*



*The  
Business End  
of Good  
Drilling  
Equipment*



